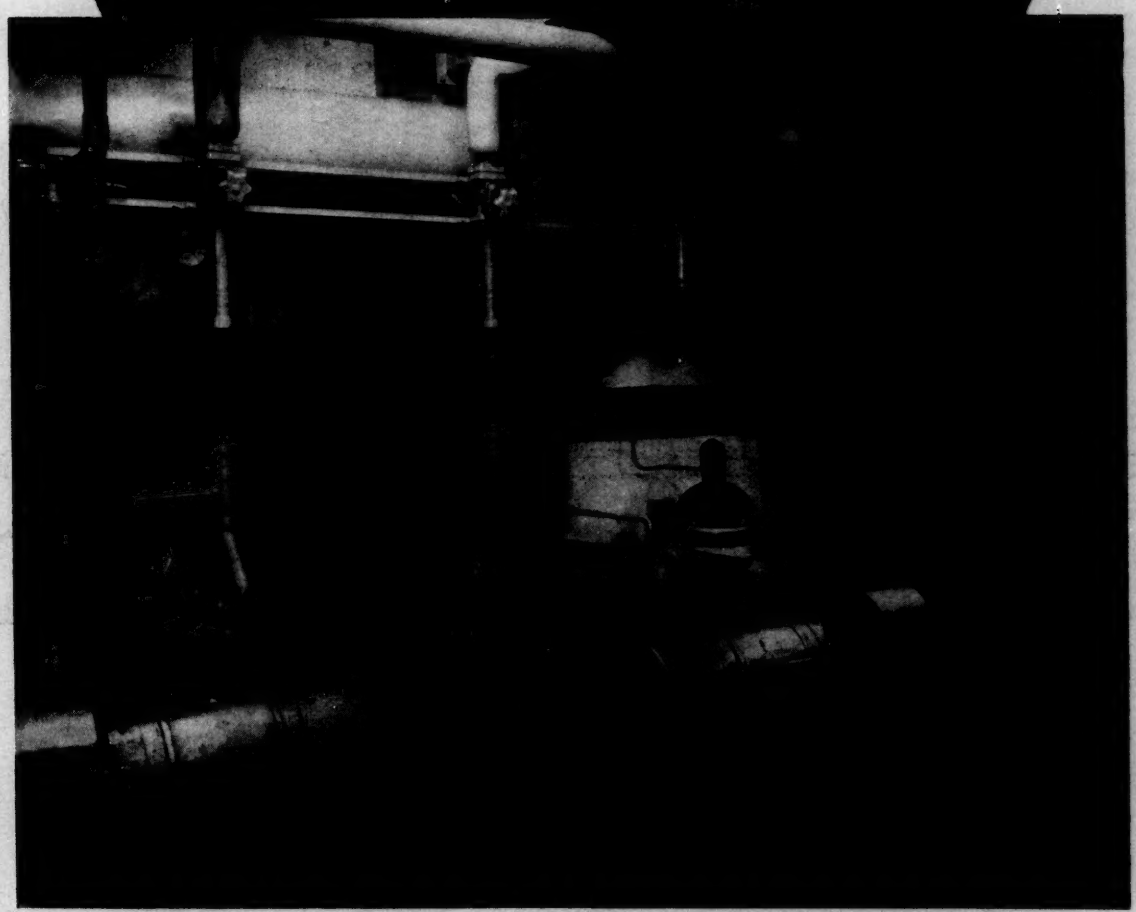
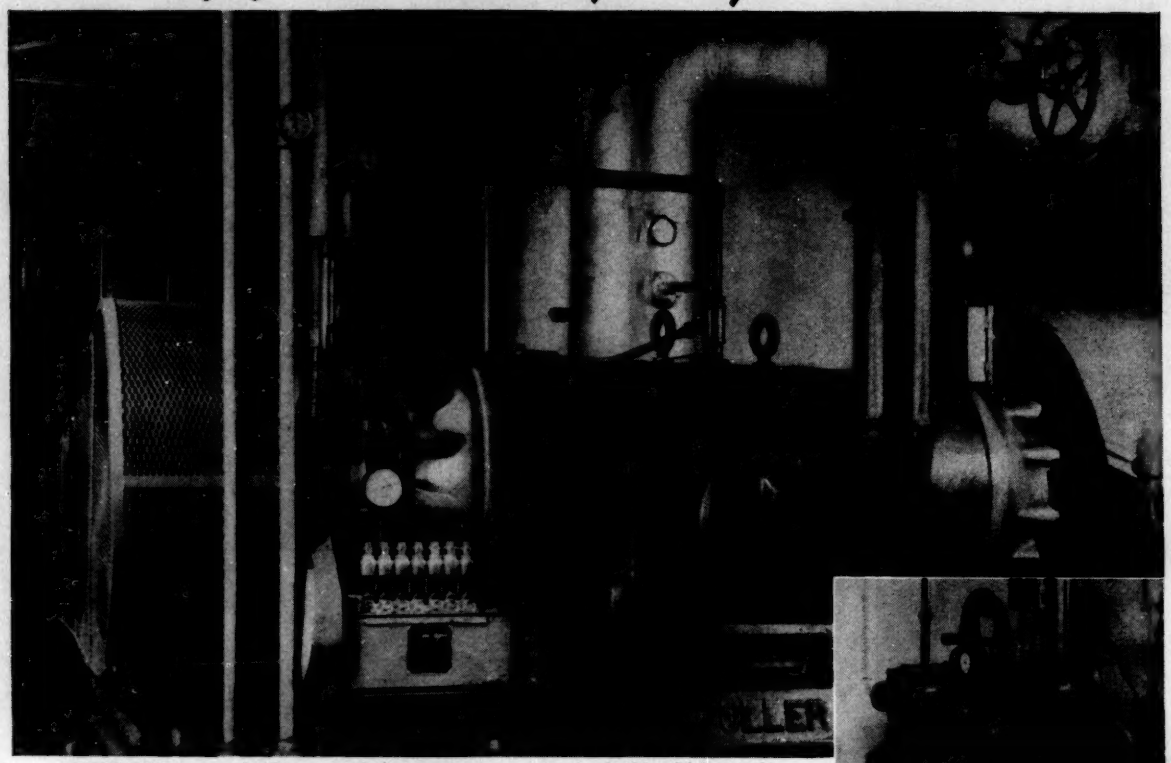
SEPTEMBER
1960

Industrial Refrigeration



COVER—A neat installation of American made refrigeration compressors in a research laboratory in Delft, Holland. See Page 24.

More Proof of FES-FULLER *Superiority*



"FES-Fuller type A-250 rotary booster compressor nearly doubles Liebmann's freezing capacity," says Herb Liebmann, Jr., of Liebmann Packing Co. Adding 100 tons of refrigeration to 110 tons supplied by existing reciprocating booster, vibrationless rotary takes light foundation—which cuts this installation cost 25%.

HIGH 6-YEAR PERFORMANCE RECORD of this Fuller C-50 rotary compressor supplying plant air led Liebmann to investigate and buy FES-Fuller rotary booster unit. Design principle is identical with that of booster units, using only 3 moving parts: rotor, sliding vanes, and bearings.

"VALVELESS" ROTARY BOOSTER COMPRESSOR CUTS INSTALLATION COST 25%

Designed without suction or discharge valves, an FES-Fuller rotary booster compressor can work more efficiently at low pressure and high gas volume than comparable types. Thus, in a two-stage system like the one at Liebmann's Green Bay, Wis. plant, even very low pressure differences can't hinder its output. Efficiency actually *increases* when system pressure drops.

Liebmann discovers extra benefits. "We wanted a compressor to handle high volumes of low-pressure suction gas in the primary phase of our recently expanded freezing system. The machine had to be rugged and trouble-free, keep original capacity for life, and be easy to install," states Herb Liebmann. Besides meeting these specifications amply, the 100-ton FES-Fuller unit takes only 10 x 12 feet of engine-room space, and cuts estimated installation cost by 25%. A light foundation is all that's needed, since rotary compressors work without vibration.

Advantages like these can be yours with FES-Fuller rotary boosters. Their simple, compact design gives big savings in space, power, money and maintenance time. They can run with almost no supervision. Patented jacket cooling of FES-Fuller rotaries eliminates freezeups. Consult FES-Fuller on the best ways to add to your freezing capacity or to design profitable new facilities. Freezing Equipment Sales engineers are always ready to help you. Write today for information and detailed literature on FES-Fuller rotary booster systems.

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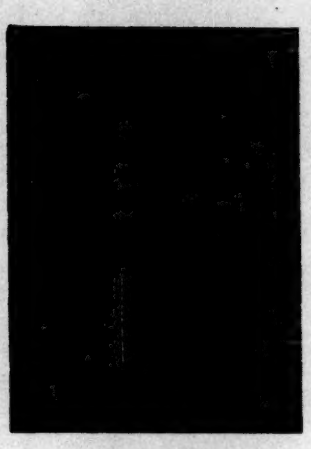
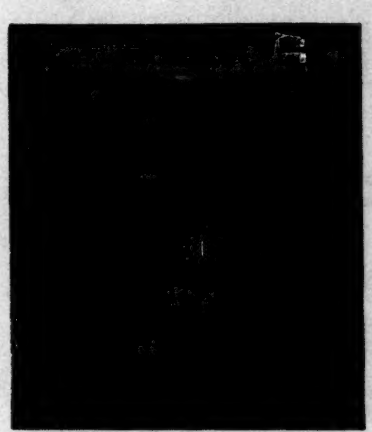


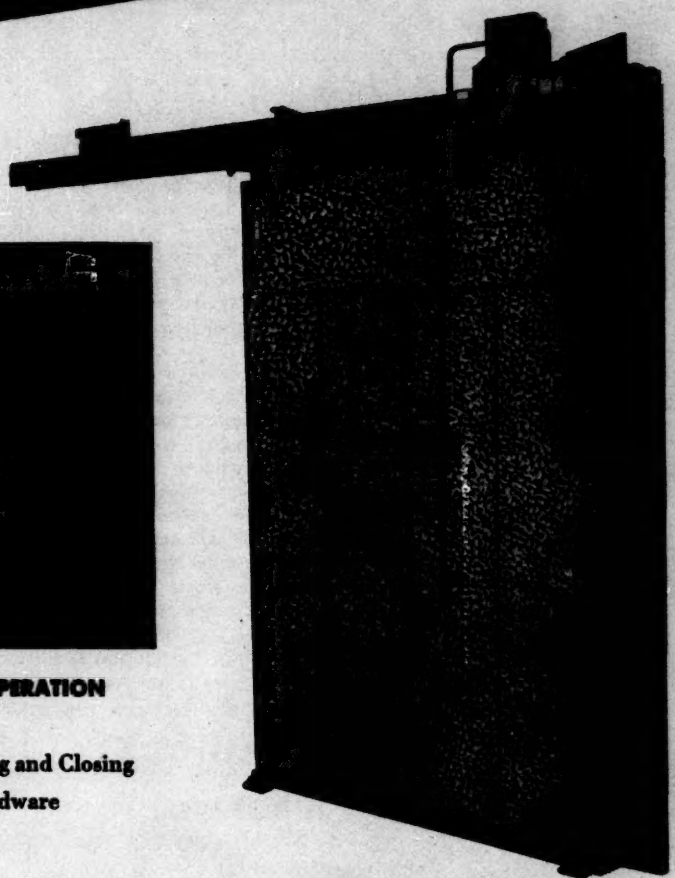
AIR OPERATION

- Safety Entrance and Exit Through Built-In Refrigerator Door
- Speedy Opening and Closing



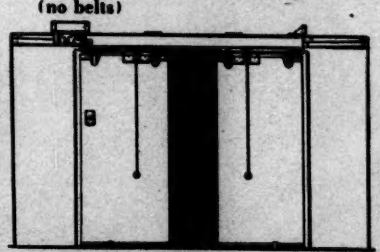
MANUAL OPERATION

- Dependable
- Easy Opening and Closing
- Durable Hardware



"Electro" SAFETY SLIDE

- Structural Simplicity
- Mechanically Sound
- Exclusive Automatic Sealing
- Gear Type Uni-Brake Motor Operation (no belts)



BI-PARTING "ELECTRO" SAFETY SLIDE DOORS

- Recommended where space factors dictate their use
- Gear Type Uni-Brake Motor Operation (no belts)

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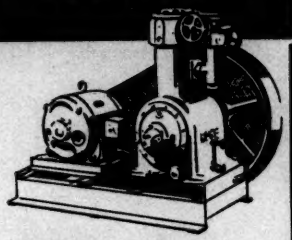

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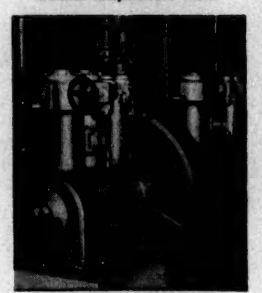

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Industrial Refrigeration

September 1960

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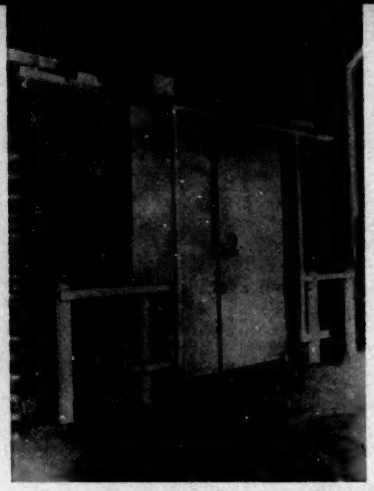
69 Years of Continuous Publication

Door Company Uses Urethane Foam To Develop Cold Storage Door



Cooler door installed for Humpty-Dumpty Warehouse in Oklahoma City. Note the guard frame to protect the automatic door mechanism from damage by fork trucks.

Ease of handling is an important factor in the success of Nopco Lockfoam. As shown in the photo above, only one pour is necessary to completely fill the cavity. Filling the door with foam is much simpler and faster than using the rigid board form method. Two men can complete a pour in 20 minutes compared with 2 hours using the old method.

Without large initial investment Lockfoam can be used in batch volume. The only equipment necessary is a mixing vessel and beater. The above photo shows two workmen at Clark preparing to mix the 2 components of the "foamed-in-place" system.

»» A NEW lightweight cold storage door has been developed by Clark Door Company. Made with a lightweight 26 gauge steel skin and using Nopco Lockfoam as a core material, the door is being used in the cold storage warehousing and frozen food industries.

Nopco Lockfoam, a urethane plastic "foamed in place" system, is poured into the door cavity as a liquid. Expanding as a result of chemical action, it pushes firmly against all sides of the door cavity and into all corners of the unit before setting up into a rigid cellular mass.

The use of foams in the door panels was a result of circumstances both coincidental and opportune. A personal friend of Clark Doors' president, Henry Clark, is in the refrigerated warehousing business. Having trouble with insulating and moisture problems at the refrigerator access points, he asked Mr. Clark to develop a door that would have a low K factor and yet be moisture proof.

Clark engineers, investigating various types of core fillers, decided on Lockfoam as the ultimate choice. An excellent thermal insulator, the foam is impervious to oils and greases, fire resistant and rot-proof, fungus and mildew proof. The meeting of steel and the foam has produced a door panel that is extremely light, flat and strong.

The skins of the doors—galvanized, aluminum, or stainless steel—are put in place on the door frame, trimmed and fastened. The door is then placed in a two piece mold. With the door in place, the mold is clamped together and placed in an upright position. Using a 2 component "foamed in place" system, an operator mixes a predetermined amount of the 2 components and then pours the liquid into the door cavity from above. A few minutes later the material has expanded to a two-pound per cubic foot foam to completely fill the cavity. Only one pour is necessary to fill the entire door.

When the foam is poured into the door panel, the pressure of the foam pushes the steel skins against the mold with equal pressure over the whole area. After the foam hardens, the panel holds its flat shape within the specified tolerances and the foam bonds to the metal, holding the skin firmly in place.

Engineers point out the foamed door is easier to make. First of all, there are fewer production steps. Filling the door cavity with the foam is much simpler and faster than using the rigid board form method. Two men can complete a pour in 20 minutes compared with 2 hours using the old method. The door is easier to handle because lighter gauge steel is used in the skin and the foam eliminates the heavy frame once needed.

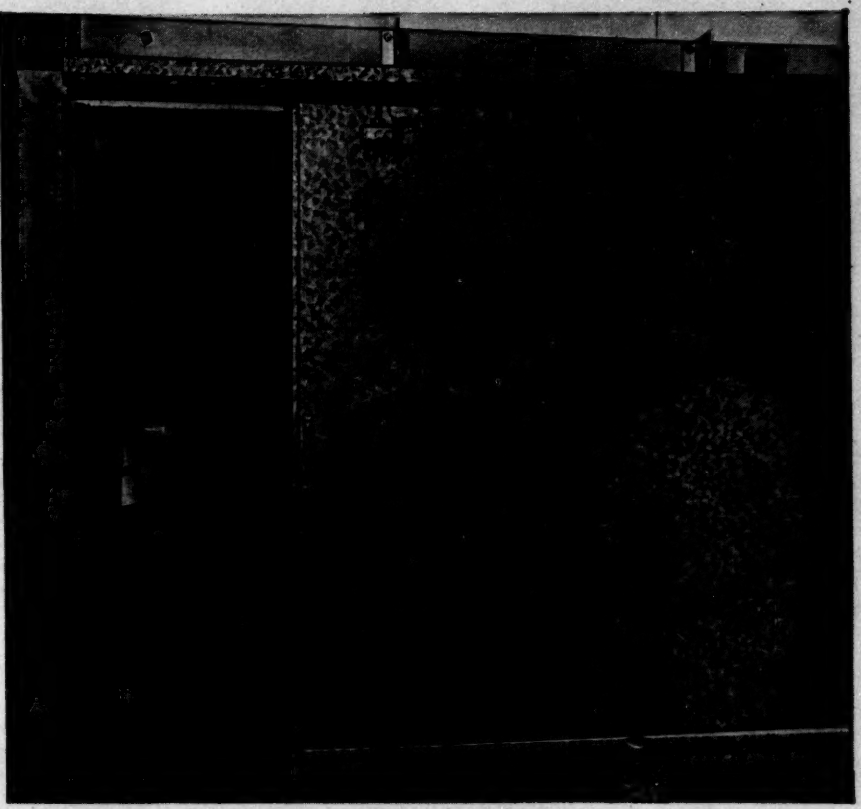
A comparison of construction makes it obvious that the old type doors are much heavier. The total weight of the old door is 40% more than the new door made with the foam. Clark engineers point out that the savings in weight has many benefits. The lighter door reduces labor costs both at the plant and during installation. Shipping charges are reduced and in the case of mechanical doors, a substantial savings is experienced in the installation of the power unit. Additional savings in weight can be had due to the low K factor of the foam. A 4" thick door can replace the standard 6" door with no loss in insulating qualities.

According to Henry Clark, Jr., sales manager, the doors are in use everywhere in the free world from the Phillipines to Finland. Users of the new doors include such companies as: The Borden Company, Campbell Soups, General Foods, Inland Cold Storage, Pillsbury Mills, Seabrook Farms and others.

Since its beginning in 1874, the goal of the Clark Door Company has been to develop quality products. Beginning with construction of overhead doors for service stations and industrial installations, their line soon included standard cooler and freezer doors, vertical lift traffic doors, and pass through doors. In 1940, the Presto Matic Door was introduced by the company. Now available in the new foam filled door, the fully automatic Presto Matic Door can be opened or closed by a truck operator without leaving his seat.

FED UP WITH SPACE-HOGGING DOORS THAT SWING OPEN?

Save Space, Steps and Refrigeration with **CLARK Manual Sliding Doors**



Self-sealing CLARK Cold Storage Doors slide horizontally to open. No need to sacrifice adjacent space in order to allow for door swing.

As the Sliding Door opens, you walk or drive through. You save time and motion because you needn't step back and travel around a swung door.

There's never any air leakage. Sealing is automatic and wedge-tight to keep cold IN . . . heat OUT. Instead of wasting refrigeration by opening the door fully, pedestrian traffic slides the door over only as far as necessary.

CLARK Doors perform flawlessly on a minimum of moving parts with only routine maintenance. No cams, springs or eccentrics to go out of whack, causing stoppages, leakage and spoilage.

CONVERTS EASILY TO AUTOMATIC OPERATION CLARK Manual Sliding Doors become automatic by the simple addition of a Prest-O-Matic® operator. No elaborate adjustments or alterations. Install CLARK Manual Doors now. Whenever you say the word, we'll supply the motive power of your choice—either air or electric. No other Cold Storage Door gives you this *long range* advantage.

Write for full information today or see our insert in Sweet's Catalog.

Air Operator. Clark Manual Doors convert to automatic at any future time by the addition of Air or Electric Power Operator.

CLARK DOOR COMPANY INC

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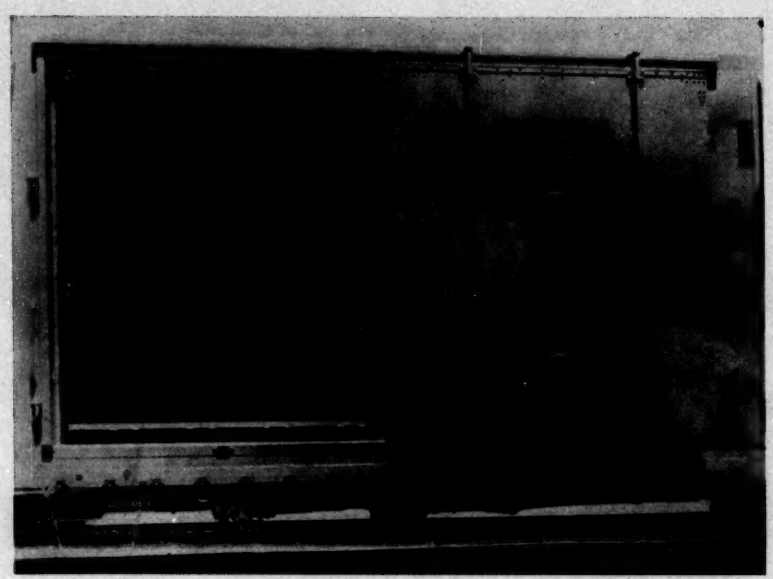


New lighter, better insulated doors on mechanically refrigerated Pacific Fruit Express car are shown here in yards of the builder, the Southern Pacific Equipment Company in Los Angeles.

And here's the completed door with Robert L. Landis, originator of the idea for the lighter, better insulated equipment and the builder of the door liner at his Santa Clara, Calif. plant.

Giant Plastic Moldings Feature New Lighter PFE Car Door Liners

»» PLASTICS developed by Koppers Company, Inc. and Borg-Warner Corporation are playing the key role in construction of new insulated doors now being installed on the cars of Pacific Fruit Express.

The first of 1,025 railroad cars in which temperature may be mechanically controlled from -10°F to 70° F have started rolling off the assembly lines in Los Angeles—each with door liners embodying the largest individual moldings ever made of the two well-known plastics. Use of these plastics improves insulation and also results in savings of from 400 to 500 pounds in car door weight.

Inside the doors, each of which is 9'3" by 8'6" by 8-5/16" thick, 89-pound moldings of Dylite expandable polystyrene from Koppers form a tight, moisture-proof non-sagging insulation. The door liners are of tough Cycolac plastic made by the Marbon Division of Borg-Warner Corporation—the largest plastic pieces ever made by vacuum forming. Special, custom-built machines are required to mold both the Koppers and Marbon plastics.

Advantages Numerous

The larger, lighter-weight doors offer many advantages to the railroads and shippers of fruit and produce. In the past such doors ordinarily have not been more than 6' wide. With the 8'6" width, larger mechanical lift trucks and loaders can be used in loading and unloading the cars.

In addition to their new doors, the PFE cars have other unique features. They are the first mechanically refrigerated cars to use all-welded construction with supporting members on the outside.

The Developer

The developer and builder of the new door liners for railroad refrigerator cars is Robert L. Landis, San Jose, California, not a complete newcomer in the railroad field. Some years ago he developed a special gasket which is widely used on railroad car doors throughout the United States. Thus, he has had close association with Pacific Fruit Express Company and other car builders.

Three years ago he first approached Pacific Fruit Express Company with his idea of combining the superior insulation qualities of Dylite foamed plastic and the tough outer-skin qualities of Marbon's Cycolac plastic in the making of lighter, better insulated doors for temperature-controlled cars. After a long period of designing the custom-built machinery, the door liners are now being produced in Santa Clara, California, by Landis Industrial Company.

Success of the Dylite insulation with Cycolac shell in the car doors is expected to lead to use of these plastics for insulating entire cars.

Agriculture Department Tests Piggyback Reefer Efficiency

»» THE transport industry will know more about the "inside story" on efficiency of refrigerated piggyback trailers and mechanically refrigerated rail cars when a test run by the U. S. Department of Agriculture over the Burlington Railroad is completed and the data evaluated.

For the 60-hour test run from Lincoln, Nebraska, to Philadelphia, the four, 35-foot Trailmobile "reefers" and two rail cars were wired for temperature readings to a special, instrument-carrying caboose. More than three miles of wire was required to connect the thermocouples from 20 locations inside each vehicle to the caboose.

Two of the Trailmobile trailers

were constructed with glass fibrous insulation—6 inches in the roof, 5 in sidewalls and 4 inches in the floor. The other two trailers were built with 4 inches of foamed-in-place polyurethane insulation all-around. The two rail cars were similarly constructed.

Harold D. Johnson, USDA transportation specialist, and two USDA mechanical engineers—Robert Gilfoy and Ronald Penney—recorded temperature readings from the 120 locations inside the six vehicles every two hours during the entire trip. This was done by first "dialing in" the desired thermocouple location on a master switchboard, then relaying the impulse on to a temperature indicator where it was recorded.

In addition, a recording device installed by the USDA team on each trailer gave an accurate check on how long and how frequently each of two types of diesel powered refrigeration units operated during the trip.

Each trailer was loaded with 25,000 lbs. of beef at the Lincoln slaughter-house of an eastern retail food chain. Some of the beef was carried as hanging load, some as floor load. Upon arrival in Philadelphia, the piggyback trailers were taken from the flatcars direct to the firm's outlets.

A report of the findings on the test trip will be published by the Transportation and Facilities Branch, Agricultural Marketing Service, U. S. Department of Agriculture, Washington 25, D. C.

Frozen Foods Coordinating Committee Goes to Work Shows Results

»» THE Frozen Foods All-Industry Coordinating Committee, representing almost all segments of the frozen foods industry, reports that since their last meeting in Chicago they have been very active in developing the committee's action program. The committee's chairman, Dr. H. C. Diehl, announced that the organization of state watch-dog committees will doubtless be completed by the time of the committee's next meeting in Washington, D. C. on September 8-9.

Committee Duties

The purpose of these state committees, on which each segment of industry is to have a selected state representative, is to have a constant, alert watch over legislature and regulatory matters affecting the frozen foods industry and to provide "grass-roots" action, when necessary in behalf of the All-Industry Coordinating Committee. State committees will also assist in the implementing of FFAICC'S educational and information programs. Their work is to be guided by an action handbook, prepared by a FFAICC sub-committee, under the chairmanship of Lawrence Martin, secretary-manager of the National Association of Frozen Food Packers.

The preparation of integrated industrial standards of quality control practice moves ahead to completion in a month or two and is the intensive work of another FFAICC subcommittee, chaired by Richard Powell, executive vice president of the National Association of Refrigerated Warehouses.

The development and coordination of the several facets of the FFAICC educational program is in the hands of a sub-committee, of which the co-chairmen are Dr. Milton A. Ratner, president of The Emery Transportation Co. and chairman of the committee on the movement of perishables by motor transport of The American Trucking Associations and Harry Schauffler, executive director of The National Frozen Food Association.

The selection and use of uniform terminology is a study task assigned to Paul Burrill, first vice president of Quincy Market Cold Storage and Warehouse Co., Boston, as advisor to the chairman.

Thus, in the short time since it was organized, the All-Industry Coordinating Committee has moved aggressively into action, and by the first months of 1961 its program will have taken hold throughout industry and begin to expand its influence.

Technical Advisors

Since the committee in its statement to AFDOUS at Dallas on June 4 stressed that its program rested on the scientific facts resulting from the time-temperature tolerance investigations of USDA's Western Research and Development Division at Albany, California and other authoritative research findings in food chemistry, technology and bacteriology, the chairman has presently as his technical advisors the following well-known scientists: Dr. Walter Maclinn, director of The Refrigeration Research Foundation, Dr. F. Miles Sawyer of the University of Massachusetts and Dr. M. J. Copley, director of the WURDD, named above.

Other activities of the FFAICC designed to bring into most effective action the frozen foods quality control program, will be announced from time to time.

It is clearly evident that all segments of industry, concerned with frozen foods, have literally rolled up their sleeves and are busily doing the spade work, which will insure that the laudable record of the frozen foods industry of this country in providing many healthful appetizing and nutritious food items, as it has in the past, will be sustained, magnified and appreciated by the American people.

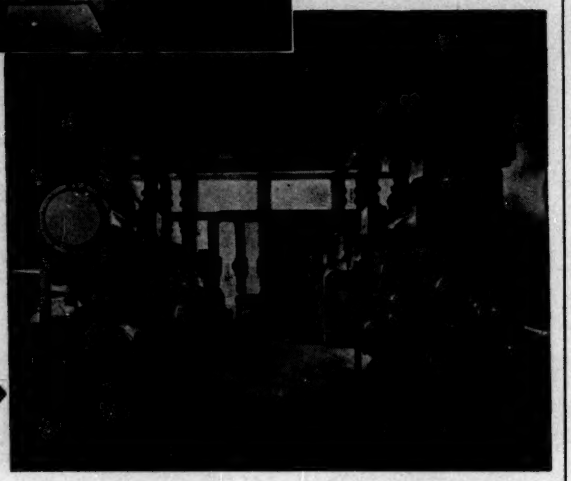
New Fluorescent Lamp For Cold Storage Rooms

Arctic temperatures fail to disturb the efficient fluorescent lamp performance in Miami's Plantation Cold Storage plant. Protected from the sub-zero cold by a glass jacket, the new General Electric lamp is the first fluorescent type to operate effectively under low-temperature conditions. The new lighting system benefits the cold storage operation also by introducing less heat into the plant than did the incandescent lamps it replaced.

Olympic Sports Palace in Rome Cooled by Vilter Refrigeration

Exterior view of Coni Sports Palace.

Interior view of the beautiful Sports Palace (Palazzetto dello Sport) with seating capacity for 15,000, conceived by Annibale Vitellozzi and built by Pier Luigi Nervi. Boxing, basketball and fencing are among the events held here.



View of the four separate Refrigerant 22 water chilling units installed in the 1960 Olympics Coni Sports Palace in Rome. These units each incorporate a Vilter 8-cylinder VMC compressor.

● Among the handsome architecture found at the 1960 Olympics in Rome is the small Palazzetto dello Sport, an all-weather sports palace built to seat 15,000 spectators. This inspiration in modern concrete form is matched by the latest innovations in air conditioning to provide comfort for athletes and fans alike.

The cooling system, custom-designed by Vilter's Italian distributor, Dell'Orto Chieregatti, provides 1,300 tons of refrigeration capacity, of which 450 tons is produced by a central system, and the remaining capacity is supplied by well water. Four self-contained water chilling units are installed in the central refrigeration station. Each chilling unit has a Vilter 8-cylinder VMC Refrigerant 22 Compressor.

This is another example of the world-wide acceptance of Vilter refrigeration equipment. The dependable performance of Vilter VMC compressors is the result of tireless engineering improvements: built-in capacity reduction, precision manufacturing techniques, painstaking inspection, careful assembly, and factory run-in tests.

Among the champions at the Olympics, Vilter compressors deserve a gold medal in their own field for efficient, reliable operation. Enjoy trouble-free Vilter equipment in your installation. Write today for helpful counsel about your air conditioning and refrigeration problems.

Sold and Installed by Vilter Distributor, SPA Dell 'Orto Chieregatti, Milan, Italy

Vilter® refrigeration air conditioning

The Vilter Manufacturing Company
Milwaukee 7, Wisconsin

Air Units • Ammonia and Freon Compressors • Booster Compressors Baudelot Coolers • Water and Brine Coolers • Blast Freezers Evaporative and Shell and Tube Condensers • Pipe Coils Valves and Fittings • Pakice and Polarflake Ice machines.

Write for Bulletin 820 to The Vilter Manufacturing Company, Dept. H-604 2217 South First Street Milwaukee 7, Wisconsin

Little Change In 1960 Frozen Asparagus Pack

»» A SURVEY just completed by the National Association of Frozen Food Packers places this season's production of frozen asparagus at 32,738,754 pounds. While this represents almost no change from last year's pack, it is still runner-up to the 37.7 million pound record production of 1956.

However, July 1st stocks of 34.2 million pounds, in spite of this continued heavy production, are less than 10% greater than the past five year average for the same period. This is indicative of a good rate of movement and suggests that the supply of frozen asparagus will continue in a quite manageable position.

Regional production distribution shifted somewhat this year. A moderate decline in the packs in the East and South and Midwest resulted in Western production rising to 65% of the total.

Smaller Packs Gain

The retail pack remained about the same this year as last. The 10 ounce package is the vastly dominant size however, a significant increase in the trend toward the 8 ounce package as an alternate was observed. The 1960 institutional pack decreased slightly, especially that in larger sizes. The 2½ pound package continues in its popularity for this trade.

Stafoam Urethane Insulation Eliminates Refrigeration On Frozen Goods Truck

»» UNUSUAL ability of urethane plastic foam insulation to maintain low temperatures has eliminated the need for a refrigeration plant on a special frozen goods truck exposed to Southern California summers.

The unit was insulated by American Latex Products Corporation, Hawthorne, California, for Western Body and Hoist Company, Los Angeles.

Five inches of Stafoam urethane was sprayed on the aluminum sheeting exterior of the truck body. Then ordinary plywood was nailed to the 1" x 6" joists. In addition to providing insulation equal to a foot of fiberglass, the Stafoam gave extra structural support to the box.

Once a suitable temperature is established for the frozen materials, the Stafoam insulation will maintain it low enough to insure against spoilage and loss.

news briefs of the month

Refrigerated Storage In New Canning Process Being Studied

Among Foundation-supported research contracts for 1960-1961 recently authorized by The Refrigeration Research Foundation is a new process coming into existence for canning of foods. It is known as high temperature–short time canning. It is becoming commercially feasible and results in a much better retention of color, flavor and texture of the canned products. However, ordinary storage temperatures result in a loss of this extra quality. The research authorized will determine what refrigerated or freezing temperatures best retain the superior quality.

LCL Shipments Simplified By Four Firms

A recent innovation in shipments of frozen foods was made possible through the efforts of Birds Eye Division, General Foods Corp., the Santa Fe Railway and the Kansas Cold Storage Inc. Through the use of compartmentized mechanically refrigerated cars, consignees of Birds Eye Frozen Foods are able to order less than carload shipments. The cars are 50-ft. 70-ton mechanically refrigerated and temperature controlled. They are equipped with load dividers on roller bearings. This enables the customer to unload only his compartment eliminating the necessity of leveling off the balance of the load. Santa Fe is equipping 100 of these cars with the load divider. Birds Eye have made shipments of frozen fruits and vegetables to three destinations in Florida loaded in one car. By the end of the year Santa Fe expects to have 700 cars of this type added to its fleet.

Ice Cooling Is Best For Fresh Strawberries

According to an announcement by National Ice Association, the removal of field heat (90° F down to 40° F) from fresh strawberries seems to be best done by forced air circulation through ice bunkers, through the fruit and back through the ice bunker. Hydrocooling is damaging to this fragile fruit. Non-iced air circulation causes shriveling of the berries and some loss of bloom. Cold rooms without forced air take six to sixteen hours to cool, and this is slow. University of California researchers developed the forced, ice air cooler that does the job in approximately two hours. Details of construction of the unit may be obtained from Professor Robert G. Pearl, Extension Specialist, University of California, Davis, California.

Navy Begins Automation of Warehouses

According to a news release from the U.S. Naval Supply Center in Bayonne, New Jersey, a great surge forward toward the complete automated warehousing of 245,000 items stored at that city's Naval Supply Center will be made in November when a 1,200 foot conveyor fitted with electronic accessories starts operating. The new operation it is stated is the forerunner of general conversion to automated warehousing throughout the Naval supply system. Other giant supply centers will probably follow Bayonne's lead. It is the start of a tremendous improvement in effective supply support of the fleet and other Navy activities. The Navy's essay into this field is the first instance of automated warehousing on a large-scale multiple-product basis.

Meat Packing Plant Planned For Bronx

The general contract for a multi-million dollar meat processing and packing plant to be erected for Stahl-Meyer Inc., in Hunts Point section of the Bronx has been awarded to Milau Associates, Inc. industrial builders of Great Neck, Long Island. The 2-story facility will have a gross area of about 140,000 sq. ft. with provision for future expansion. The structure will be air-conditioned and will have a refrigerated loading dock which will accommodate 17 trucks in addition to a number of cold storage and freezing rooms.

Denver Firm Doubles Capacity

Mountaire Farms of Colorado, Inc., successors to Maplecrest Farms of Colorado will be one of the West's largest independent poultry operations under expansion plans, it was announced recently. The firm, located in Denver, Colorado, states its $100,000 expansion will double the size of the processing, refrigerating and storage facilities and will add a new fleet of refrigerated trucks. Mountaire's distribution of poultry and eggs will cover the entire Rocky Mountain region from Montana to the Mexican border. Its branded fryers, turkeys, poultry specialty items and eggs already have wide distribution in the Denver area. The firm recently purchased a 560 acre farm which will enhance growing operations. Modern facilities are now being built there.

Centrifugal

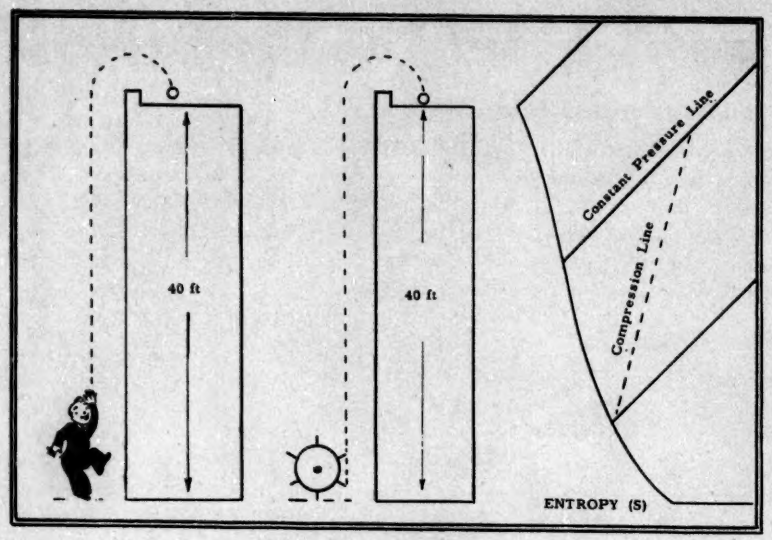


Fig. 1—Basic Head Diagram

$$\text{WORK DONE ON BALL} = \frac{WV^2}{2G} = W \times H \text{ (FOOT POUNDS)}$$

$$\text{WORK DONE PER LB.} = \frac{V^2}{2G} = H \frac{\text{(FT. LB.}}{\text{LB.}} \text{ or } \frac{\text{BTU)}}{\text{LB.}}$$

$$\text{POWER} = \frac{\text{FT. LB.}}{\text{LB.}} \times \frac{\text{LB.}}{\text{MIN.}} = \frac{\text{FT. LB.}}{\text{MIN.}} \text{ or } \frac{\text{BTU.}}{\text{MIN.}}$$

$$\text{HORSEPOWER} = \frac{\text{FT. LB.}}{\text{MIN.}} \times \frac{1}{33{,}000}$$

Fig. 2—Formulaes

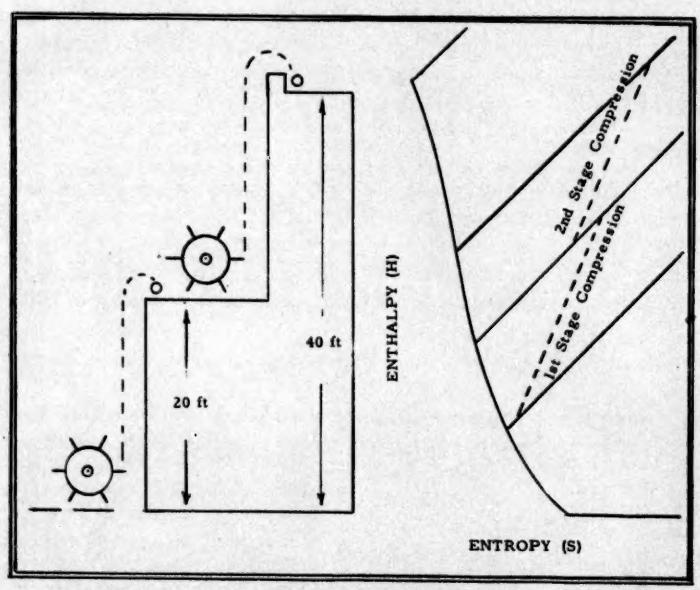


Fig. 3—Two Stage Machine

»»» CONSIDER a centrifugal compressor as being just as simple as throwing a stone to the top of a building, as shown on Fig. 1, then we can easily analize most of the properties and theory of operation of the centrifugal compressor. First of all, you know that you have to accelerate the stone to sufficient velocity so that the Kinetic energy in the velocity of the stone is equivalent to the potential energy at the height to which you want to throw it. Now the simple equation for Kinetic energy is $\frac{WV^2}{2G}$ where W is the weight of the stone and V is the velocity as it leaves your hand. This is also equal to the potential energy of the stone as it reaches the height, represented by WH, where H is the height. From this simple equation, we can see that the height to which the stone is thrown is a direct function of the square of the velocity with which it leaves your hand. Looking at the next part of Fig. 1, where we show a wheel picking up a stone, and throwing it to the height of the building, we can say that the height to which the stone is thrown is a function of the square of the velocity of the wheel.

Next in Fig. 1, we have a thermodynamic diagram for a typical refrigerant gas, on which we have height shown as Btu's per pound, or foot pounds per pound, or commonly called head in feet. Thermodynamically, this is equivalent to compressing from the evaporator pressure to a higher pressure represented by the condenser pressure. For this reason, we commonly speak of a compressor as developing a certain head, and we designate this either as Btu's per pound, foot pounds per pound, or simply feet of head. Another characteristic of throwing the stone is that as long as you are throwing a stone, it doesn't matter much if you are throwing a stone weighing two ounces or one weighing a pound, your arm can accelerate it to about the same velocity, and

Refrigeration Theory

By J. H. ANDERSON,
Turbo Compressor Section,
Industrial Division,
York Corporation.

throw one about as high as the other.

By the same token, a centrifugal compressor going at a certain velocity will develop the same feet of head, whether it is throwing rocks, water or gas. Also, it will throw as many stones, or as much water, or as much gas as you can pour into it, as long as there is room for the gas to move out at that velocity, and as long as there is enough power to keep the compressor wheel going at that speed. This merely shows the truth that a centrifugal compressor can theoretically handle any capacity from practically 0 to a maximum at which it chokes, and develop approximately the same head.

Fig. 2 shows some of these simple truths in the form of these simple equations. First, we have $\frac{WV^2}{2G} = WH$, representing the head equation.

This also represents the amount of work done on the substance, no matter what it is, being handled by the compressor. The horsepower is merely the rate of doing work, or the number of pounds per minute being handled times the head in foot pounds per pound, divided by 33,000.

Now let's go on to something a little bit more complicated. Assume that we have a building which is so high that you can't throw a stone fast enough to get it to the top. You already know the answer. We build a ledge half way up, and have someone else catch the stone and throw it the other half of the way up. This is shown in Fig. 3 as a two stage compressor. One stage of the compressor lifts it through half of the head and then the other stage picks it up and lifts it through the other half of the head. It is immediately obvious that in order to compress gas through a higher head or a higher range between evaporator and condenser, you have to either run the compressor faster or use more stages at the same velocity. In the past, it has been accepted practice to use two or three stages in centrifugal compressors for compressing to ordinary heads encountered in water cooling for air conditioning. For lower temperature cooling of brine, it has been necessary to use more stages of compression.

Now, since we have, during a summer's operation, various condensing temperatures available, it becomes obvious that the head required of the compressor is not the same at all times. The variation in head requirement can be taken care of in a number of different ways.

First of all, we could run the compressor fast enough to develop the highest head ever required and then have a variable speed drive to reduce the head as required when the condensing temperature falls. However, it is usually cheaper, simpler and more practical to use constant speed induction or syn-

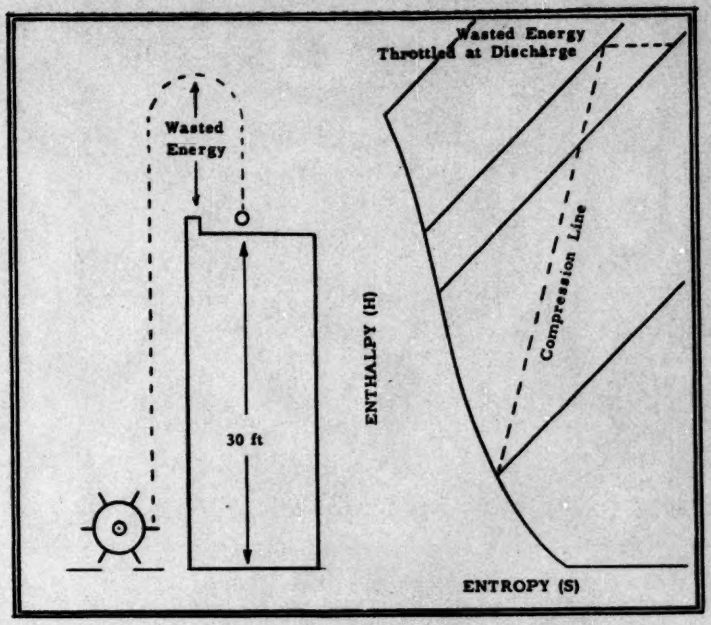


Fig. 4—Throttling at Discharge

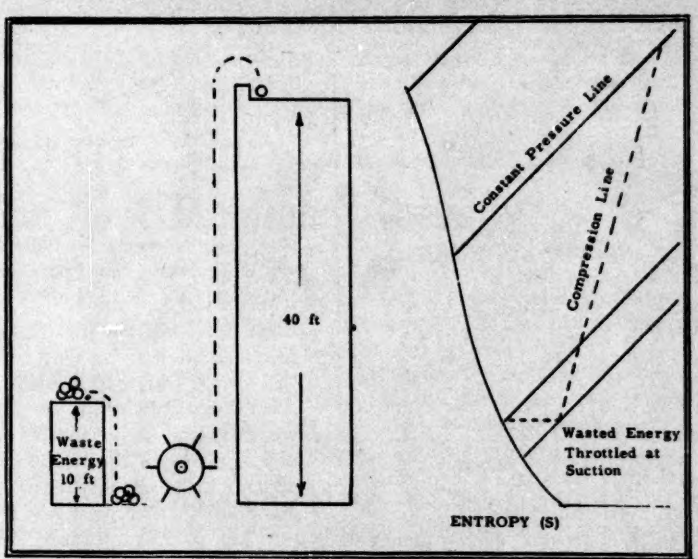


Fig. 5—Throttling at Suction

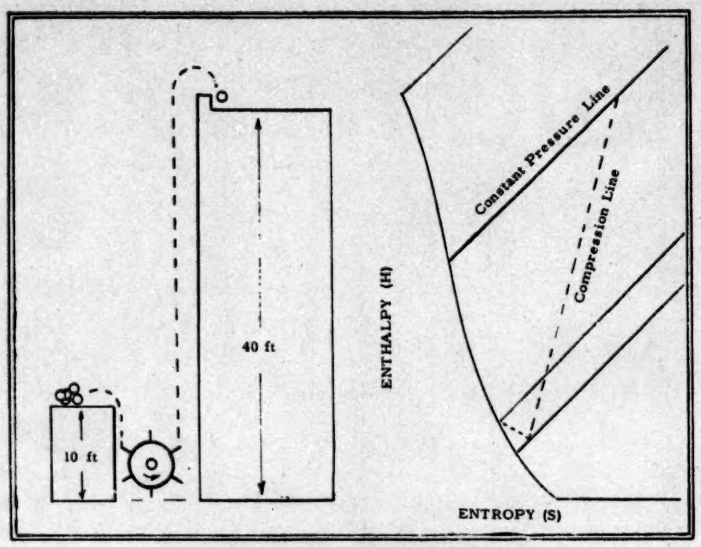


Fig. 6—Operation of Pre-Rotation Vanes

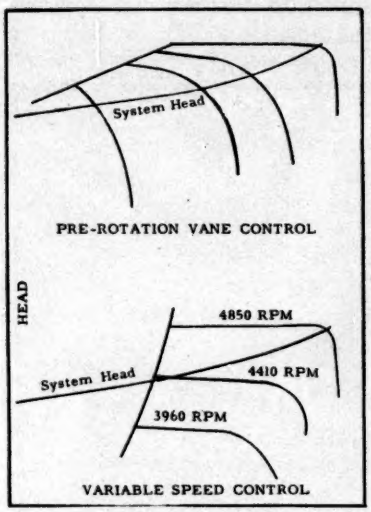


Fig. 7—Capacity

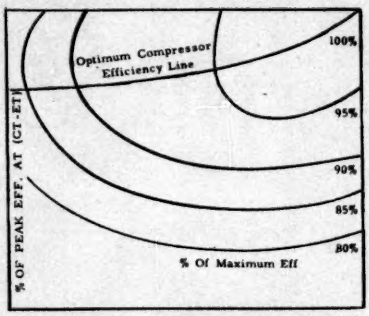


Fig. 8—Percent of Peak Efficiency—Tons

chronous motor drives for a centrifugal compressor which makes it impossible to reduce the speed when it is desired to reduce the head. Therefore, in order to use a constant speed motor, it becomes necessary to find different ways of reducing the head when necessary.

A second method of reducing head is by suction throttling as illustrated in Fig. 5. This is shown by having the compressor wheel drop down into a pit. In this case we drop the stone to the bottom of the pit, then the wheel picks it up and throws it just as high as it did before, but now it just reaches the top of the building. In this case energy is wasted by dropping the stone from the edge of the pit down to the bottom. This is done in actual practice by throttling from the evaporator pressure to a lower pressure at the inlet of the compressor, through the throttle valve. Just as in the case of discharge throttling, this wastes energy. The diagram on the right illustrates the thermodynamic meaning of this and shows the throttling line as the horizontal one to reduce pressure on the entropy chart.

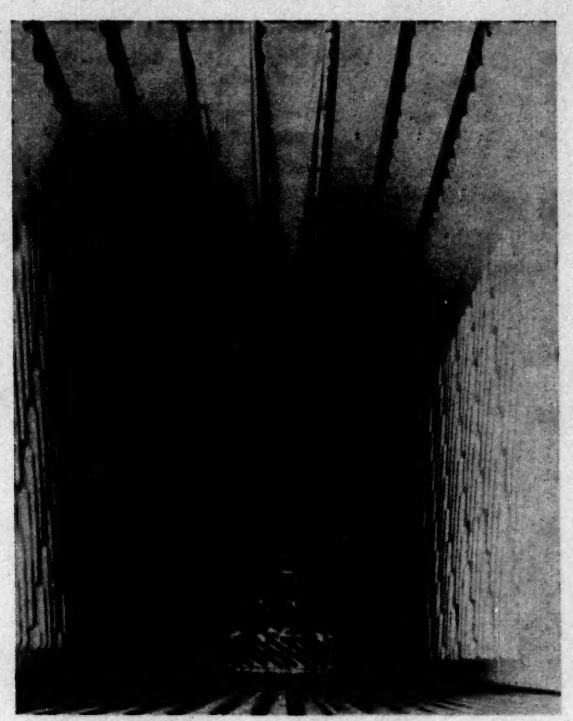
A third method of head control is by means of adjustable pre-rotation vanes which York introduced to the refrigeration industry fifteen years ago. Fig. 6 illustrates the principle. In this case, to reduce the head we do just as in the previous one, drop the pressure, or as indicated in the diagram, drop the compressor wheel down into a lower level pit. Here, instead of dropping the stones to the bottom of the pit, and then having the wheel pick them up and throw them as high as we have done before, we drop the stones right on the opposite side of the wheel, and the energy of the falling stones helps to turn the wheel. Therefore the energy is not wasted as it was before, but in theory, the energy expended is merely the net energy of lifting from the edge of the pit to the height of the building. The thermodynamic equivalent of this is shown in the right of Fig. 6, where we show the pressure reduction process as being almost an isentropic process, instead of a throttling process as was the case in the previous illustration. What the adjustable vanes actually do are to act as turbine nozzles, changing the pressure energy developed by the dropping pressure into velocity of the gas pointed in the same direction as the wheel is going, and this actually helps to turn the compressor wheel.

Now let's look at a comparison of actual compressor curve characteristics with pre-rotation vanes in comparison with operation with speed control in Fig. 7. We plot as the ordinate head which can be

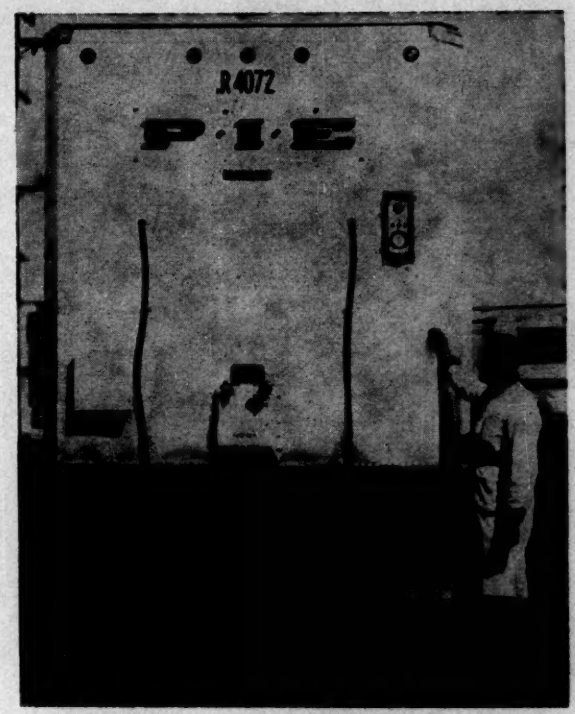
Continued on page 23

REFRIGERANT PROPERTIES COMPARISON FOR 35°F. EVAP. TO 105° CONDENSING.

Refrigerant	Evap. Press. psia.	Cond. Press. psia.	Head Ft.	Cfm/Ton 1 stage	Hp/Ton 1 st.	Cfm/Ton 2 st.	Hp/Ton 2 st.	Relative Cost/lb.
R-12	47.3	141	6690	3.42	.805	2.65	.740	40
R-114	13.7	50.3	5790	10.2	.815	8.42	.735	100
R-11	6.26	25.8	8300	18.1	.754	16.2	.700	34
R-113	2.33	11.6	6800	45.0	.760	39.2	.710	90



Inside rear-to-front view of trailer with new refrigeration system. Note staggered ceiling ducts, wall ribs, and floor sections which facilitate air circulation.



Control unit for new refrigeration system can be seen at right center in this front trailer view. Diesel engine, compressor and condenser are under the trailer about center.

Truck Refrigeration That Maintains Humidity

»» BY assuring uniform cooling and preventing the dehydration of perishable food products, a new-type mechanical refrigeration system now being used by Pacific Intermountain Express, Oakland, Calif., is reducing in-transit spoilage as much as 31% in highway reefers.

Made to order by Thermo King Corp., it is briefly a full cycle reverse system which may either heat or cool air in order to hold produce temperature within 1° F. of a given thermostat setting. Its heating capability is said to be of special significance because it permits the protection of a trailer's contents when prevailing outdoor temperatures are too low—for example, where citrus fruit must be protected by temperatures of 30° to 40°F. in sub-zero weather.

The system maintains the degree of humidity that protects perishables in a refrigerated warehouse by circulating nothing but the air that is in a reefer at the time it was loaded, and by diffusing the flow of air over and around a load in such a way that there are no intense currents to remove moisture from localized parts of the load.

Basic components of the system are a diesel engine, a condensing section, and a cooling section. The system cools until a predetermined thermostat setting is reached; and, when the temperature falls below the setting, the system automatically switches to heating by reversing the cycle.

To assure the uniform release of cooled or heated air, the system uses a series of ceiling outlets which are located at regular intervals from the front to the rear of a reefer. The air is ducted to the latter outlets by more or less conventional means; and, after circulating over

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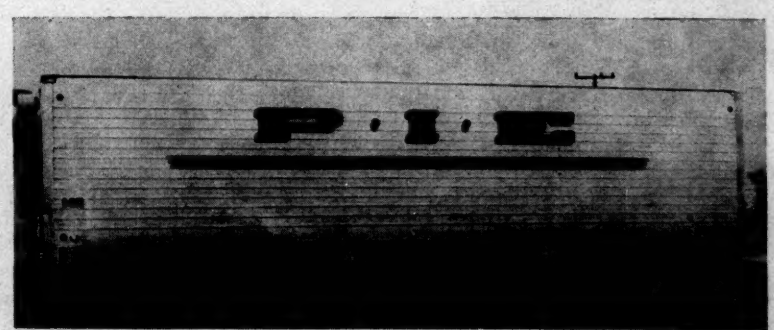


Side view of trailer with new refrigeration system. Main cooling components can be seen directly beneath the center of this reefer's chassis.

Here is a graphic description of the pneumatic, electric and electronic control systems used for refrigeration and air conditioning. The article also offers suggestions of where and when each should be used.

Selecting Temperature

»» IN the early days of man's civilization, our forebearers were forced to seek refuge in caves to escape the elements and to protect themselves from wild animals. Today we erect buildings not only to escape the elements, but to create our own self-determined environment. Today we dig deep holes in the ground to protect ourselves from destruction above.

Today, in other words, we build primarily to create our own indoor climate for living, for working, for safe-keeping. And all the thought, and all the material that goes into the construction of these structures is aimed at creating the proper climate.

The air conditioning system is the one facility that can create this environment.

The proper selection of temperature and humidity control is the one assurance that your air conditioning facility will fulfill the initial purpose of the building.

This proper selection of temperature and humidity control therefore becomes of the utmost importance, and in fact, can largely determine the effectiveness of your building program.

Good automatic control and good design go hand in hand. Poor controls can nullify good design. Poor design cannot be corrected by good controls.

And so I believe that we should pause for a moment, and determine some of the elements of good automatic control. We know, for example, that the designer of an air conditioning facility aims for quiet, constant air volume equally distributed in an even pattern. But we know he cannot attain this if he chooses to start and stop his fan from an on-off thermostat. Just as he aims for a constant flow of evenly tempered air, so must he choose a modulating type of thermostat, valve motor or damper motor to achieve the aim of even temperature and humidity.

If his design includes both valves and dampers, he also realizes that he must select temperature and humidity controls that will properly sequence the operation of his equipment so that each control will function as part of a team for the greatest possible efficiency and closeness of control.

The project engineer will also realize that his criteria specifies a certain temperature and humidity in each space, and that these temperatures and humidities have been selected because they will contribute to the greatest efficiency of the occupants, or in a laboratory, to the closest work tolerance. And so he will make every effort to control his system, not from the return duct away back in the mechanical equipment room, but, most logically, from a thermostat or humidity controller on the wall. The thermostat must be selected and its location determined during the design stage for best measurement and for easy and logical installation.

I need not point out the importance of closing water valves on fan or power failure, or shutting outdoor dampers or opening steam valves on fan failure.

And so we must be certain that control motors are properly selected to be normally open or normally closed, depending on the application at hand.

I cannot refrain from mentioning one development which has rapidly attained new importance in the last several years. How many times have you stepped into the mechanical equipment room of a large building and found no means of quickly evaluating and checking the air conditioning facility? Modern efficiency has dictated a very definite and increasing use of a centralized data panel so that the operator can quickly detect operating irregularities and provide instant control of all equipment from a single central location. Training time is reduced for new personnel, walking time is saved by instant adjustments right at the panel. Central switch-over for summer-winter or day-night systems is readily added. More benefits are possible than we have time to enumerate in this discussion.

These, then, are some of the fundamentals that we must consider when we team up good design with good automatic control.

It is equally important that we select the medium of control best suited to the job at hand. Bearing in mind the points we have just covered, we must now determine whether that medium shall be Pneumatic, Electric, or Electronic.

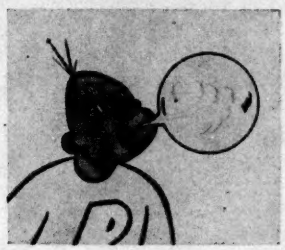
Let's review very quickly the basic principles of operation of each of these three types of control. First. pneumatic control.

By J. H. BROOME

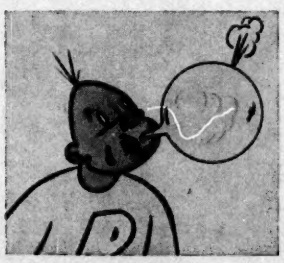
Mr. Broome is Manager, Federal Services Group, Minneapolis Honeywell Co. This paper was presented to the Air Force Conference in Dayton, Ohio.

and Humidity Control

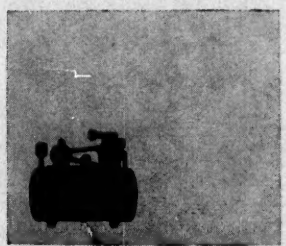
Here's a chesty character with a "P" on his shirt. Maybe you think he's full of hot air, but he isn't. He's actually full of clean, dry, filtered air and in the next slide you find him blowing up a balloon.



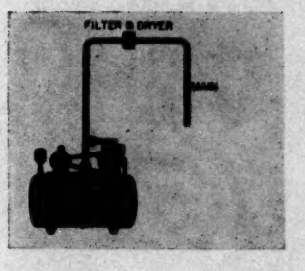
He's using that air as the medium for doing work, for expanding the balloon. Now suppose that balloon has a tiny pin hole of a leak in it.



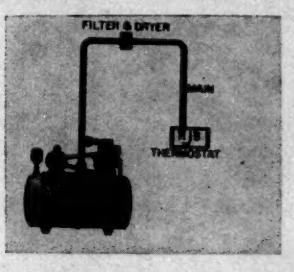
Mr. Pneumatic has to keep blowing pretty steadily just to maintain the balloon at one size. But if he puts his finger over the hole, he can then enlarge the balloon. If he takes his finger away, and the pin hole becomes gradually larger, more air may be lost than Mr. Pneumatic can supply. And the balloon collapses. The basic principle of a pneumatic control system is just that simple.



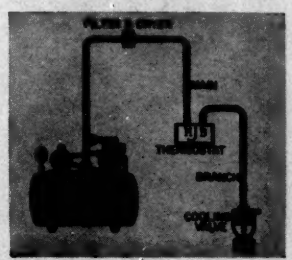
Instead of Mr. Pneumatic, we have a compressor.



Instead of the mouth of the balloon, we have a main air line.



Instead of a pin hole leak, we have a thermostat, or other controlling device.



Instead of the balloon, we have a bellows or diaphragm-operated pneumatic motor. In effect, the controller becomes a pressure regulating device and allows air to be delivered to the controlled device at a pressure which is varied according to the change required in the controlled condition. That condition may be measured, for example, by a bi-metal, a volatile liquid filled bellows or other temperature sensitive element, or by a hair element humidity sensing device or by a bellows or diaphragm sensitive to pressure.

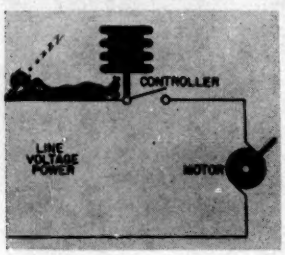
Basically, then, a pneumatic system is made up of five elements:

1. A source of clean dry compressed air to provide the operating energy.
2. Main air lines from the air supply using either copper or plastic tubing.

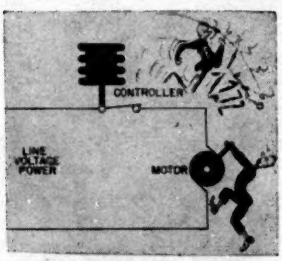
3. A controller into which is built a temperature, pressure, or humidity sensitive element whose movement causes a vane or flapper to move toward or away from the nozzle through which the air bleeds.
4. Branch lines from the controller.
5. Controlled device such as motors or relays.

I do want to point out that we have outlined only the basic elements of a pneumatic system and have not touched upon the many devices available, such as, non-bleed thermostats, positive positioning relays, differential diverting relays, graduate relays, etc., which permit such great flexibility in a pneumatic system. Technical engineering manuals are available that cover in detail the construction, operation and desirability of incorporating such items into a control system.

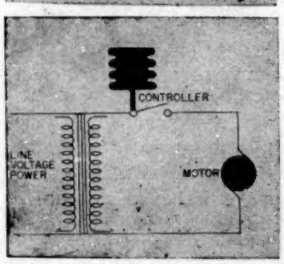
Next, suppose we look briefly at electric control. This character with the "E" on his chest represents electric energy. He gets that energy from a power line at 115 or 230 volts ac.



Normally, when no action is called for by the controller, Mr. Electric is fast asleep along the power line. But suppose the controller, in this case a thermostat with a volatile liquid fill bellows, feels a rise in the temperature of the conditioned space. Expansion of the bellows then flips a mercury tube or actuates an enclosed snap action-type switch to close the circuit. What happens to Mr. Electric?



He instantly awakens, and races through the controller switch to the motor, where he goes to work. His path is along No. 14 or 16 wire, enclosed in BX or conduit.

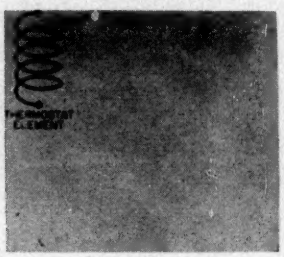


Frequently, we can interpose a transformer into the circuit, reducing our primary voltage down to 24 volts. We can then let Mr. Electric travel along No. 18 thermostatic color coded cable, and possibly avoid the need for conduit. Then, too, it's a lot safer to tangle with Mr. Electric when he's 24 volts strong, than when he is 115 volts strong. He is also more sensitive.

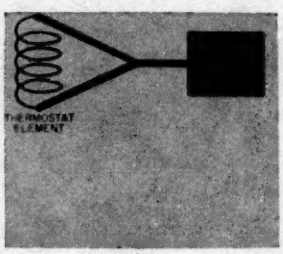
Summing it up, the standard electric control circuit consists of:

1. A source of primary voltage, with possibly a step-down transformer.
2. A controller into which is built a temperature, humidity, or pressure sensitive element and which activates some type of switch whether it be a mercury tube or an enclosed snap action type switch.
3. Wiring in conduit or bx for line voltage or thermostatic color coded cable for low voltage.
4. Controlled device such as motors or relays.

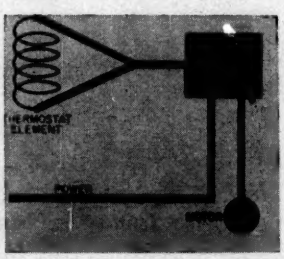
Now let's get along to Mr. Electronic. Some people may not know him well, but he's been around for quite awhile, and knows how to handle himself with a high degree of accuracy and finesse. He is also extremely sensitive to a change in resistance. So if we send him through a piece of resistance wire, his strength will depend upon the value of that resistance. Let's take, purely as an example, a 500 ohm resistor.



If the ambient temperature drops one degree Fahrenheit, the resistance might readily become 499 ohms instead of 500 ohms and Mr. Electronic would therefore be a little stronger. But that strength is relative, as it is measured in millivolts.



So we have to build up his strength from "flea" power to "elephant" power by running him through a vacuum tube or transistor.



In other words, we can put that very small change in resistance to work controlling the flow of brine through a valve, the flow of air through or around a damper or any combination of actions designed into the particular system at hand.

Essentially then an electronic system consists of:

1. A source of electric energy.
2. A coil of resistance wire that performs the sensing function.
3. An electronic relay which performs the measuring and amplifying functions.
4. Shielded cable for the electronic circuit; standard wiring for the power supply.
5. The usual motors or relays.

Now that we have reviewed the basic concepts of pneumatic, electric and electronic control, how shall we select the one best suited for the job at hand? We could list all the applications from electronic instrument shops to administration buildings to hospital buildings. We could list all the different types of air-conditioning systems and refrigeration systems. But we would soon find that the size of the projects and systems, their geographical location, and the degree of control precision required would vary in each case. This would require a multitude of detailed listings and would therefore not be a workable approach.

Again, we could select a medium on the basis of picking out the control devices with which we are most familiar. Perhaps we are accustomed to using a mercury switch thermostat, a potentiometer type thermostat, a remote bulb controller, or outdoor control. They are all fine in their proper place. But a control system must work as a complete unit so that it becomes one member of the team of "Good Design and Good Automatic Control." We must coordinate every unit of our control system so that the control system does function as a complete unit. So obviously we cannot use this approach as a basis for selecting a medium.

Let's get back to certain basic fundamentals that must be considered when your temperature control system is first laid out on the drawing board.

First, the design must be dictated by the requirements of the building's occupants to perform their necessary functions at the highest efficiency. Let's call it need.

Second, the design must be dictated by the ability of the temperature and humidity control system to maintain the desired conditions in the space and by the effect of the control system on temperature, relative humidity, air distribution, and cleanliness as they affect the occupants. Let's call that performance.

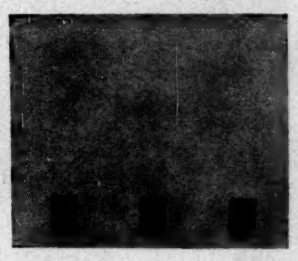
Third, the design must be dictated by the control system which will provide the lowest cost from the viewpoint of long life, including initial cost, maintenance, and operating cost. Let's call this owning and operating cost.

These three fundamentals will determine how close we must control temperature and humidity. These will determine whether we should simply turn a motor or solenoid on or off, or whether we must proportion the flow of conditioned air or liquid in accordance with demand. These will determine the need for sequencing valves and dampers. And these will also determine the choice of the most service-free equipment. In other words, we must choose the particular medium of control which will satisfy need, performance or owning and operating cost.

We can then design our control system irrespective of size, geographical location, or application, and know that we are obtaining the environment for which the building was planned.

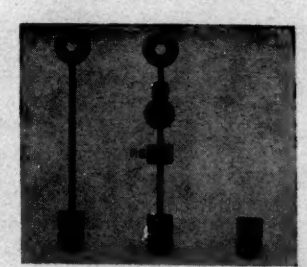
Let's make some comparisons and look at some typical problems.

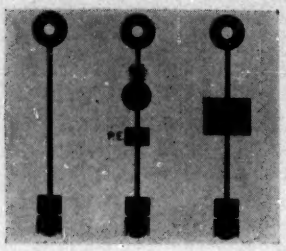
First, two-position control. In two-position control the final control element occupies one or the other of two possible positions, except for the brief period when it is passing as rapidly as possible between the two.



Here are three solenoid refrigerant valves. We can control these valves very simply by an electric thermostat connected directly to the valve.

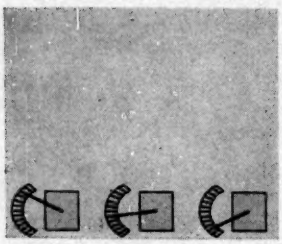
We can also control it by a pneumatic thermostat, but we must interpose a relay to convert air pressure to electric power. And notice also that we need a compressor to supply air.



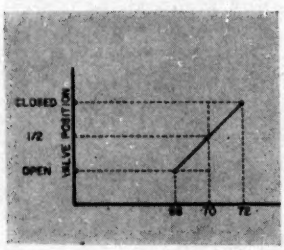


We can do it electronically by means of a thermostat and an amplifier relay.

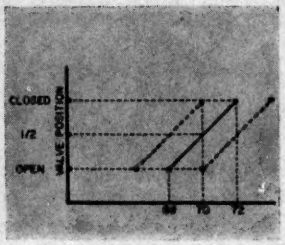
Draw your own conclusion as to which medium to choose. In doing so, do not forget, of course, that your decision may be affected by the distance between thermostat and valve, or the total number of thermostats involved. So, from an economic standpoint, the determining factor might be the cost of running wiring or piping.



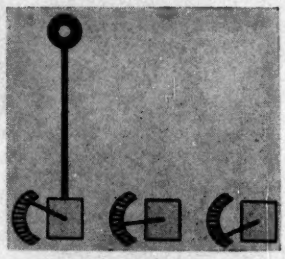
Next, modulating or proportional control. In this type of action, the final control element moves to a position proportional to the deviation of the value of the controlled variable from the set point. There is one and only one position of the final control element for each value of the controlled variable within the proportional band of the controller. Thus, the position of the final control element is a continuous linear function of the value of the controlled variable. Because there is but one position of the final control element for each value of the controlled variable, a sustained deviation is necessary to place the final control element in any position other than the middle of its range. For example, under ideal load conditions, a thermostat controls in the middle of its proportional band or differential and if we are controlling a face and by-pass damper, the dampers will be half open. Any deviation from the set point will cause the dampers to take up a new position, one way or the other. This deviation from the set point is known as offset.



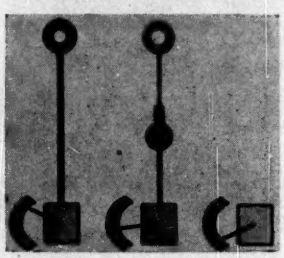
Offset can be shown graphically by drawing a vertical line for, let's say, the position of a steam valve on a reheat coil and a horizontal line for temperature. The solid oblique line then represents the degree of valve closing, as the temperature rises from 68° to 72°F. You can readily see then that the temperature must rise to 72° to close the valve completely, or fall to 68° to open the valve completely.



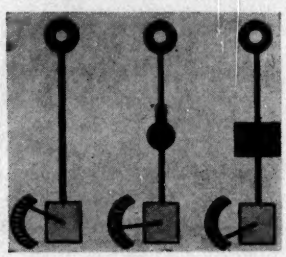
Now if our load conditions rise drastically, and if we can shift the oblique line to the right, by some means or other, we can then continue to control at 70°, for the valve is now in the full open position. The reverse load condition, as symbolized by the dotted line to the left, would put the valve in the full closed position. In any but full load or no load condition, the valve, of course, would assume some intermediate position. Deviation from the set point can be handled effectively by automatic reset devices, where this becomes a problem.



Let's see how we can hook up a thermostat to a modulating motor. Electrically we can install a proportional or modulating-type thermostat wired directly to a modulating-type motor.



Pneumatically we still need the compressor, but we can eliminate the electric-pneumatic relay.



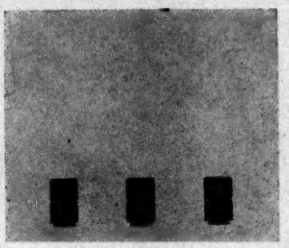
Electronically, we use the same equipment shown in the on-off control action, but make our adjustments in the amplifier relay.

Again, your decision must be based upon factors previously mentioned for on-off control. However, those factors will play a larger part in considering proportional control because you will not usually find requirements for just one or two thermostats and motors, except on the very small jobs.

Many job specifications call for the control point to be reset up or down its scale range as some other variable changes. For example, we may wish to nudge up or down the setting of the dew point controller off of an air washer as the humidity in the conditioned space falls or rises. Or we may wish to raise or lower the control point of a discharge controller in an air conditioning fan system, should the conditioned space temperature fall or rise a fraction of a degree from the set point. Such control action, of

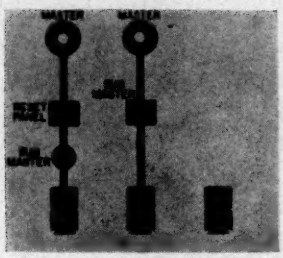
course, does an excellent job of preventing hunting, or wide swings in temperature, especially where high ceilings occur, or where air changes per hour are down to a minimum. This is known as a master-submaster system.

If then, we can measure a change in a load condition by means of a master thermostat, we can then readily reset the control point of a submaster.

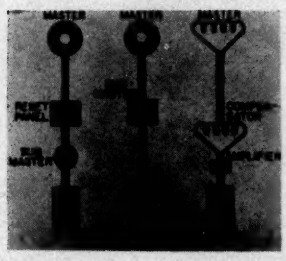


To illustrate how such a master-submaster control action can be performed by pneumatic, electric, or electronic types of control, let's start out with these 3-way valves. Let's suppose they are regulating the flow of chilled water and sump water to an air washer, and we are controlling the valve action by a room thermostat, or even by a discharge air controller acting as a dew point controller.

The electric control uses a proportioning, or potentiometer type thermostat and a reset panel containing the mechanism for mechanically resetting the control point of the submaster.

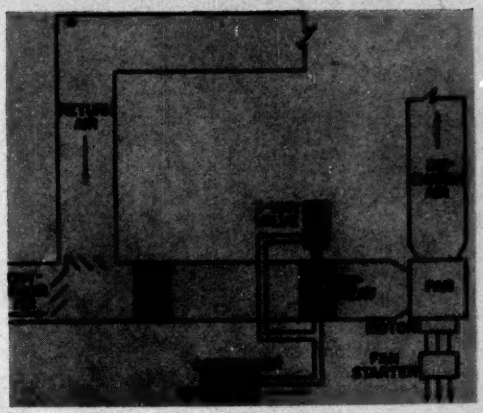


Pneumatically, the master thermostat is piped up to a submaster and hence to the valve.

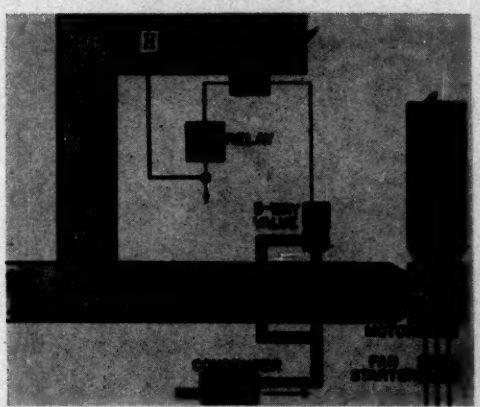


Electronically, a master thermostat is wired into a second or submaster thermostat through the amplifier and then to the valve.

Now suppose we look at a basic fan system, with fresh and return air inlets, a direct expansion cooling coil and a reheat coil. Using such an arrangement, we may want to maintain a dry bulb of 80° F. and a maximum of 50% rh. We want to do it simply, easily and economically. But we also want to obtain good control.



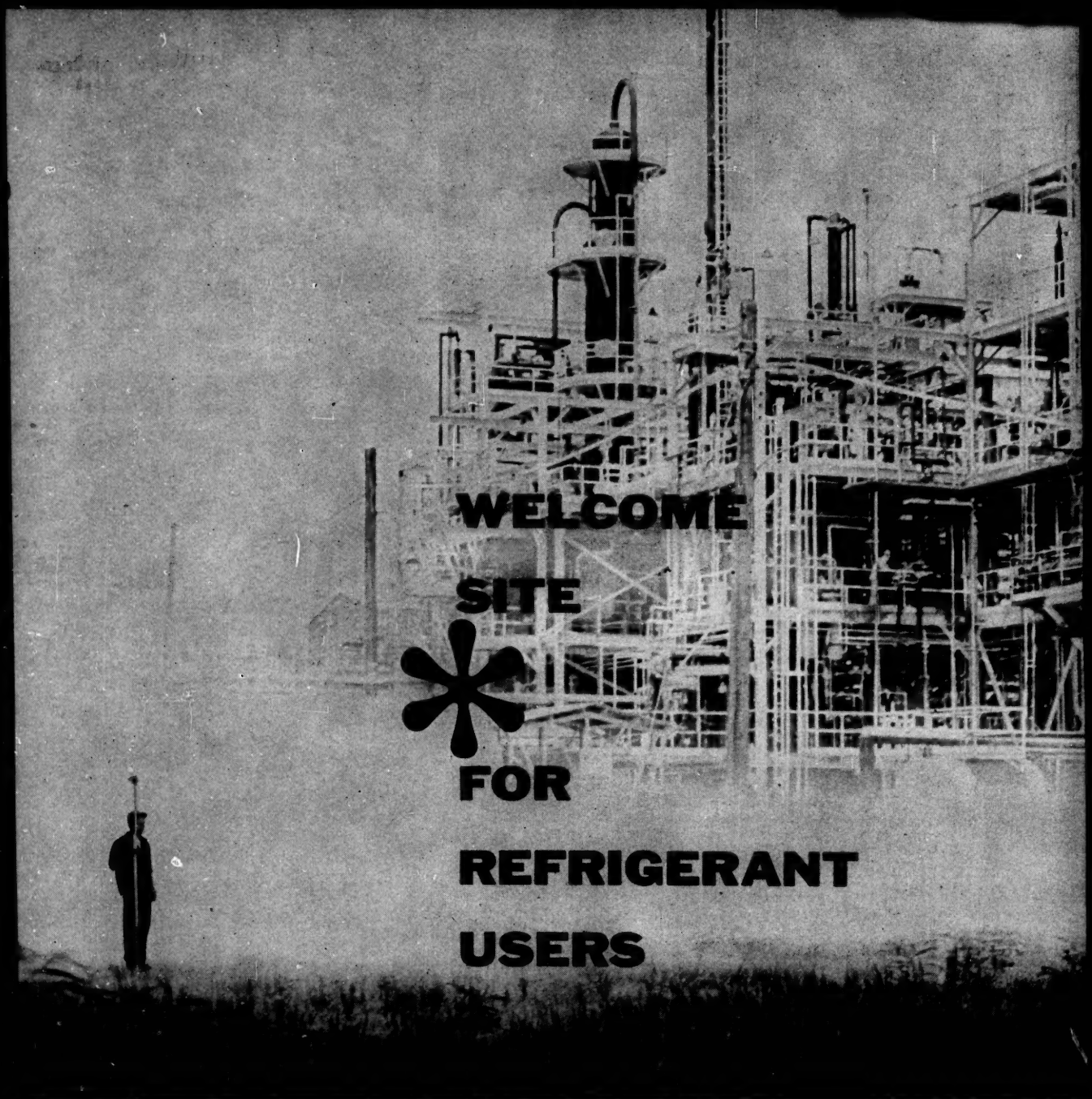
Here's how we can do it electrically. Essentially, we have a temperature controller of either the room or remote bulb type, with two sets of contacts, one a potentiometer, the other a single pole, double throw contact. Upon a call for cooling, the thermostat, through a relay, opens a solenoid refrigerant valve, or energizes a compressor starter. Upon a call for heating, the same thermostat modulates the valve



on the reheat coil. If the relative humidity rises above 50% rh., the humidity controller will energize the cooling circuit. Should the dry bulb then begin to fall below the setting of the thermostat, the latter will modulate the reheat valve to maintain the dry bulb control point. It should be brought to your attention, however, that the thermostat, in order to swing from heating to cooling, and in order to modulate the valve, must have a differential of approximately ±1½°F. in order to take care of all load conditions.

Under normal load conditions, of course, the control point would not vary this greatly from the set point, the control point being the value of the controlled variable which the controller operates to maintain at the moment, and set point being the value on the controller scale at which the controller indicator is set. It would vary this greatly under no load or full load conditions, and it is for this reason that systems requiring very close and very constant temperature must incorporate automatic reset into the system, at some additional expense.

Turn to page 22



*General Chemical announces a new genetron®

Soon east coast air-conditioning and refrigeration wholesalers and original equipment manufacturers will be "next door" to a large new source of "Genetron" Super-Dry Refrigerants. General Chemical has started construction of new "Genetron" manufacturing facilities at its Elizabeth, N. J. Works.

This will be the third "Genetron" plant, supplementing those in Baton Rouge, Louisiana, and Danville, Illinois, and increasing our overall production capacity by more than one third.

This new "Genetron" plant is another example of General's efforts to serve the growing needs of the air-conditioning and refrigeration industry and will reflect the advanced manufacturing and process control techniques which have grown from General Chemical's leadership in fluorine chemistry.

"Genetron" Super-Dry Refrigerants are stocked by all leading wholesalers coast to coast. Insist on the best... insist on "Genetron" Super-Dry Refrigerants from *your* wholesaler.

plant in Elizabeth, N. J.

BATON ROUGE, LA.—From this giant fluorochemical center shipments of "Genetron" Super-Dry Refrigerants speed to wholesalers and equipment manufacturers and to our "Genetron" stock points throughout the nation.

DANVILLE, ILL.—General Chemical's Danville plant assures Midwest users of a dependable supply of "Genetron" Super-Dry Refrigerants. This plant also backs up supply to General Chemical's nationwide network of stock points.

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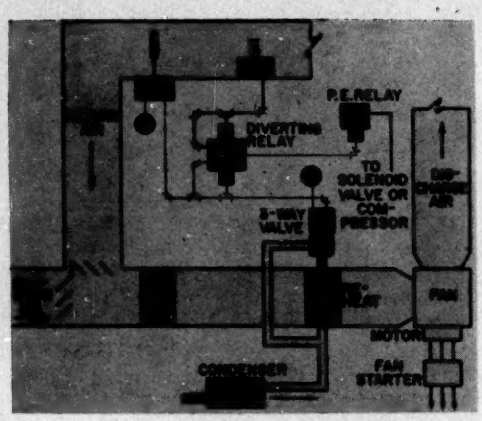
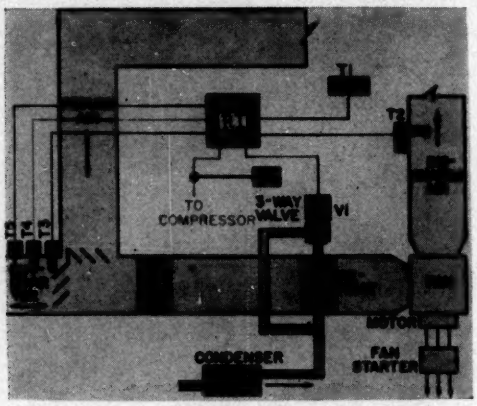


Can we do this same thing pneumatically? Yes. The same sequence holds true. But the ease with which we sequence controls pneumatically can cut down the differential between full load and no load conditions to keep it within a degree or less.



Our third possibility is an electronic system. Here again the same sequence is followed, with an electronic thermostat, humidity controller and relay amplifier. But we need a differential in the thermostat to be able to sequence the cooling and heating valves under all load conditions. And because of this differential, the space temperature necessarily must be at the high point of the differential scale to obtain full cooling, and at the low point of the differential to obtain full heating. In an electronic circuit, we do not have a mechanical differential. But we do have an electronic differential, which, because of the sensitivity of the resistance element, can be narrowed to the point where we can keep our control point within a degree or less. With the addition of resistance coils, we can also obtain economizer operation of outside air dampers.

The distinctive characteristics of electronic sensing elements may be combined through an electronic-pneumatic relay with the ruggedness, quick response and inherent adaptability to modulating operation of pneumatic motors or actuators. This also makes possible a centralized system for master-submaster control.

Certain critical applications almost demand one of the three mediums of control. Here are a few that fall in that category.

One is hospital operating rooms. The highly explosive nature of the modern anesthetics makes pneumatic control very desirable. It is possible to use electric remote bulb instruments in the exhaust air, or to use a room thermostat under definitely prescribed conditions; but if a pneumatic system is in other parts of the building, it is the only choice.

Paint spray rooms and similar applications would definitely come into the category of pneumatic control.

Constant temperature, constant humidity rooms, where temperature and humidity swings are extremely wide and extremely swift require precision instrumentation, either pneumatic, or electronic, equipped with automatic reset. In certain missile installations, speed of response is extremely urgent, so that only pneumatic operators can meet specified timings. In other missile installations, shock proof and vibration proof controls are a requirement and again pneumatic controls are called upon to do the job. Timed or sequenced operations can often be programmed electrically but employ pneumatic actuators. Electric limit controls may be combined effectively with a pneumatic control system.

Methods of Installation

In making a selection between pneumatic, electric, and electronic, you will want to know something about installation methods, as you may feel they will affect your decision.

In pneumatic control, we should particularly keep these items in mind:

First, we need a source of clean, dry air. This may be obtained by installation of an air compressor, or it may be taken from an existing air line, provided that air is constantly available. Some air lines for shop or industrial use are shut down at night, and it would be uneconomical to run a large industrial type compressor, instead of the very small one required by the control system.

Second, we need air tight copper tubing, properly dripped at the low points for the periodic release of any accumulated moisture.

Third, we must test the piping layout for leaks before it can be put into operation.

Fourth, we make our final adjustments at each thermostat, or controller, determining the air pressure at which each is scheduled to control the valves, dampers, or relays. Where an electronic-pneumatic transducer is incorporated, we can make our thermostat adjustments at the central panel.

Electric Control

First we need a source of constant primary voltage. Usually it is necessary to provide a step-down transformer. This can be one master transformer in a small building or separate individual ones can be installed for each controlled motor. If the latter are used, power should be taken ahead of the local fused lighting circuit, so that interruptions of local power will not shut down the control system.

Second, in new construction it is usual to pull wiring of suitable color coded cable through conduit. In existing work, such cable can often be run in

BX, or No. 18 thermostatic color coded cable can be utilized where feasible.

Third, after installation of wiring, the wires must be rung out to determine that splices, if any, have been correctly made, and the color coding adhered to.

Fourth, adjustments must be made at the controllers to obtain correct sequencing, etc.

Electronic Control

First we need a source of constant power primary voltage and a central electronic network.

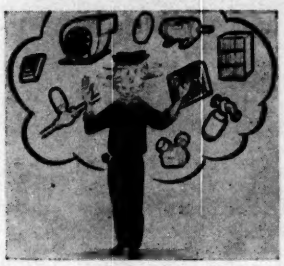
Second, installation of low voltage shielded thermostatic cable, color coded, or plastic covered conductor run in conduit.

Third, the testing of the wiring.

Fourth, adjustments are made at the central electronic control panel after valves and dampers have been properly set.

Trouble Shooting

Trouble shooting is a nasty word in any man's language. But we all face the problem at one time or another, of determining why the humidity is too high; why the control point seems to vary from day to day, or from hour to hour; and similar problems.



So we are faced with a multitude of fans, dampers, relays, heating coils, valves, pumps, and all the other pieces of mechanical equipment that go to make up a complete air-conditioning or refrigeration system. Where shall we look first? Here are two principles that will help more than anything else to spot the trouble quickly.

The first is an intimate knowledge of just what your system is designed to do; its sequence of operation; and how each piece of equipment functions.

The second is a basic knowledge of what a control system can do, and also, what it cannot do.

I am not going to say much more about trouble shooting for two reasons: One, good periodic maintenance, good preventive maintenance will cut trouble shooting down to a negligible factor. By that, I mean, pneumatic or electric controllers should be checked periodically for calibration, pneumatic lines should be regularly cleared, electric thermostat contacts should be regularly cleaned, electronic tubes should be periodically checked, pneumatic compressors must be oiled regularly. Electric motor and valve linkages must also be checked and oiled. Electric control motors should always have oil immersed gear trains to cut down on the need for maintenance. Valve stem packing should be adjusted to prevent dripping. These and other maintenance items, will cut down trouble shooting to a minimum.

If the control system is kept properly oiled and cleaned and maintained, troubles will, 9 times out of 10, not be found in the control system. We have found that a goodly percentage of controls returned to the factory for repair, when properly cleaned, are found to be in perfect operating condition. So, whether you choose a pneumatic, electric, or electronic control system, trouble shooting can be enormously reduced through good periodic preventive maintenance.

Centrifugal Refrigeration Theory

Continued from page 12

in Btu's per pound or foot pounds per pound or just feet, versus volume of gas being handled, or we can use the scale tons of refrigeration. This curve shows the characteristics of the heat exchange system when operating with, constant chilled water temperature or constant condensing water temperature. Notice that at the right hand point where the capacity is up to rated capacity, the head required of the compressor is 100% as shown. As the capacity decreases, the temperature difference between the refrigerant and the chilled water and also the condensing water, decreases, and the head required of the compressor becomes less. Therefore, as we reduce capacity, we need less head. As shown by these curves, this can be achieved by moving this compressor characteristic curve down by reducing the speed.

Wherever the compressor characteristic curve intersects the heat exchanger characteristic curve or system curve, results in the capacity at which the system will operate. Notice that on the compressor characteristic curve, the left hand point represents a limit of stable operation called the surge limit or the hunt point. This represents a point in operation below which the centrifugal compressor becomes unstable and pressures surge up and down. Operation in the area below this is undesirable and could, over a long period of time, be injurious to compressor parts such as bearings and seals.

As you want to reduce the load with speed control, you get down to a certain speed and then the compressor reaches the surge limit as shown. Now compare this with what happens with pre-rotation vane control as shown in the top of Fig. 7. In this case as we keep the speed up and change the setting of the pre-rotation vanes, we change the shape of the curve and actually move the stable point of operation back to the left. As shown this means that the pre-rota-

tion vanes can operate at lower capacity successfully than can a compressor with only speed control. This has been one of the prime features of pre-rotation vane control, and is what made it more popular over the years.

Fig. 8 shows an actual efficiency map of a compressor with PRV control. Notice that the maximum efficiency points more or less lie on the probable operation line of this system. The operator of this system does not need to know anything about how to vary the speed of the system in accordance with system requirements. This gives him complete flexibility to operate over a wide range of load, and all he needs to know is to operate the hand wheel turning the pre-rotation vanes; or still more simply, to have the pre-rotation vanes operated by an automatic controller. This is, to our knowledge, by far the simplest and best control means for centrifugal compressors.

Fig. 9 shows some of the characteristics of the most commonly used refrigerants. These four are the refrigerants most commonly used today in centrifugal systems. Note that R-12 operates entirely above atmosphere, R-114 and R-11 operate partly above and partly below atmosphere and R-113 operates entirely below atmospheric pressure. Next, we show the head in foot pounds per pound between 35° and 105°. The highest head will require the highest tip speed in the compressor.

Truck Refrigeration

Continued from page 13

the top of a load, it moves downward via ducts created by angular wall ribs (which keep containers from coming in contact with the main wall surfaces).

On reaching the floor, the air is able to circulate through a multitude of perforations in the vertical members of T-sections which support containers above the floor level before it returns to the heat transfer coil.

Following a warming or cooling cycle, air is forced through the aforementioned ceiling ducts by heavy-duty fans with aluminum blades.

Temperatures that can be held by the system range from -30° to 70°F. with 85% to 95% relative humidity.

Where it is necessary to protect perishables with two different temperatures in a single trailer, ducting may be varied and an insulated bulkhead may be installed for the alternate circulation of air through two areas. In the first area, the air imparts a relatively low temperature and picks up heat—after which it can naturally produce a somewhat higher temperature in the second area.

Dutch Research Uses American Made Air Conditioning

»» THE air conditioning installations in two modern research laboratories at the Technical University in Delft, Holland offer proof anew that technology knows no nationality.

There, equipment of American manufacture plays an important part in satisfying stringent conditions in the Textile Research Laboratory and the Institute of Metal Research.

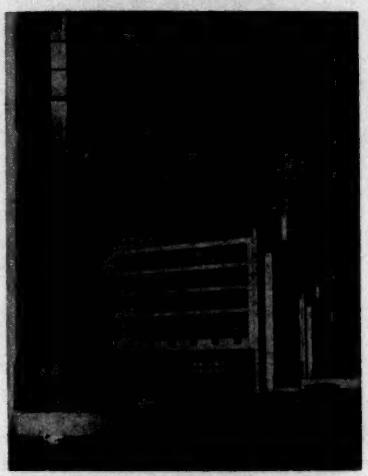
In the textile lab, where control of humidity is equally as important as regulation of temperature, humidifying is carried out after the desired cooling has been accomplished.

The refrigeration plant, powered by two 27 hp. Brunner compressors, see front cover, has a capacity of approximately 160.000 kcal./h at an evaporating temperature of 1°C. and a condensing temperature of 25°C.

The cooling unit itself is provided with 3 expansion valves and control of the installation is effected by three servo operated back pressure regulators served by thermostatic, constant pressure and solenoid valves. Depending on the temperature in the outlet airduct, the thermostatic valve regulates the main valves, three of which are connected in parallel.

Capacity is regulated by a modulating pressure control which operates a program switch. Depending on the capacity required, this control switches 2 cylinders (and, respectively, 1 of the motors) off or on. When no further cooling is required, the solenoid valve in the liquid line closes and the installation is pumped down, after which switching off by the low pressure control takes place.

From the cooling unit, air is ducted into various sections of the laboratory, in each case passing first through an air treatment box.



Exterior view of the modern textile research laboratory, Technical University, Delft, Holland, air conditioned by American made products.

Metal Research Lab

In the metals lab, where research on metal alloys is conducted, the requirement is for constant temperature. In principle, the installation is similar to the one in the textile lab. But there are 2 major differences.

First, conditioned air is delivered directly into the laboratory; there is no individualized after-treatment for different sections of the lab. Instead, air passes through a single unit equipped with face and bypass dampers, spray systems for moistening and dew point control, air heaters and ventilators.

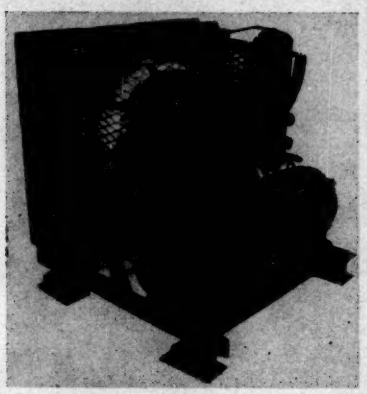
The second difference is in capacity of the refrigeration installation. Here, it is only 50.000 kcal./h. Regulation of capacity and temperature is handled as in the textile lab, except that smaller type of back pressure regulator is used.

New Products Designed to Improve Operation

New Reefer Car Unit

››› A HIGH-CAPACITY mechanical refrigeration assembly with easy-to-service features has been developed by Carrier Corporation for use in railroad reefer cars.

A separate motor and compressor permits quick replacement of either of these vital working parts with virtually no loss in availability of the car. Installation and servicing is further facilitated by easily-disconnected, self-sealing couplings which eliminate the need to dehydrate the system before it is put back in operation.



Designed to operate between —10° F. and 70°F., the Carrier compressor is driven by a 15 hp electric motor that lowers temperatures rapidly. The compressor automatically starts unloaded, a safeguard which permits easier starting and longer life. A centrifugal fan with backward curved blades guards against overloading the evaporator fan motor and new prismatic sight glasses make it easy to check the liquid level in the receiver.

Low-Cost Insulating Fill

››› A LOW-COST, low-density insulating fill, specially suitable for use with low temperature liquified gases is now available from Johns-Manville. Perlox, formed from expanded silica aggregate, offers the maximum thermal resistance at a minimum cost, according to Johns-Manville, yet is completely safe for the majority of cryogenic applications, including insulating liquid oxygen and liquid hydrogen.

Perlox, a completely inorganic material, is both physically and chemically stable, and because of its structure and powder form, provides very little body for moisture pickup. When the material is settled in place it has a density of only 3 pounds per square foot. Temperature limits for Perlox are from minus 450°F to plus 1400°F. At minus 300°F it has a thermal conductivity of slightly less than .10 Btu in. per sq. ft. per degree F per hour. It is available in loose powder form, packed in paper bags.

Additional data on Perlox can be obtained on request to Johns-Manville, 22 East 40th Street, New York 16, New York.

33 Ton Hermetic Packaged Air Conditioner

THE largest fully hermetically sealed, factory charged, packaged air conditioning unit in the industry has just been unveiled by the York Division of Borg-Warner Corporation —the EW400.

The new king-size packaged unit is said to be especially suitable for industrial - commercial applications heretofore solved only with built up systems or combinations of smaller packaged units.

According to David H. Crawford, commercial sales manager at York, the new Embassy EW400 is a four-step system employing four compressors. This means low inrush starting current. A unique, newly developed "Sequencer" control assures that under all operating conditions, no more than one compressor will start at a time.

"Step Cooling" means that the EW-400 works only as hard as is necessary. As the cooling load increases, each system automatically cuts in as required. In addition to providing excellent temperature and full time humidity control, this saves on operating costs due to decreased power usage.

Crawford also pointed out the low cost per ton with the Embassy EW-400. "When it comes to full hermetic packaged air conditioners, the EW400 is the biggest and has the lowest cost per ton of any factory wired, charged and tested unit we've ever made", Crawford said.

The EW400 produces in excess of 400,000 Btu/hr. (33.3 tons). It will cool and dehumidify up to 15,000 cfm of air at commonly encountered ductwork pressures.

Both 7-1/2 and 10 hp fan motors are available. Coupled with oversized blowers, this assures air handling ability to meet even the most difficult application problems, with or without steam or hot water heating coils.

DOW | INSULATION

Mr. Harry Schreckinger, senior partner of Globe Cork, inspects Chock Full O' Nuts' new commissary freezer (background).

CHOCK FULL O' NUTS TURNS OVER ALL COLD-ROOM PLANNING AND CONSTRUCTION TO AN APPROVED INSULATION CONTRACTOR

"Globe Cork Insulation Company—a Dow Approved Insulation Contractor – assisted with the planning and construction details of the new 13,000 cu. ft. refrigerator in our commissary. This freed our own design departments for other work in expanding our coffee plant and bakeries," says Mr. Samuel Ostrove, V.P. of Chock Full O' Nuts, New York restaurant chain.

"Globe also helped plan and build other refrigeration and freezing units in our commissary and in two of our new restaurants. We told them what units we needed and how big they should be. Globe did all the rest—installation and supervision – using Styrofoam® insulation, which keeps our refrigeration rooms at a constant 35° F., and our freezers at an even ten below."

Globe Cork relies on Styrofoam* because this low-cost insulating material is durable, has a low "K" factor that *stays* low, and does not attract vermin—a vital consideration where food is involved. In addition, lightweight Styrofoam is so easily handled that installation costs are minimized.

Styrofoam contains millions of tiny, non-interconnecting air cells which provide high resistance to water and water vapor. Water doesn't penetrate, to freeze, swell and crack the insulation. Insulating efficiency stays high over years of service, regardless of humidity.

The man who displays this seal is a Dow Approved Insulation Contractor. He's one of the special group of low-temperature insulation contractors selected by Dow for their experience and abiiities. Each of these contractors has an excellent business reputation, based on high quality workmanship; and each takes great care to follow Dow recommendations for installing Styrofoam.

There's an Approved Insulation Contractor near you. Contact him when you next plan to install low-temperature insulation. He'll provide invaluable assistance at every step in the operation. For the names of Approved Insulation Contractors near you, write THE DOW CHEMICAL COMPANY, Midland, Michigan, Plastics Sales Department 1641BU9.

**Dow's registered trademark for its expanded polystyrene.*

The closed cell structure of Styrofoam controls the passage of heat, water and moisture, providing permanent insulating efficiency. Cold rooms stay uniformly cold, easing the operating load on refrigeration equipment.

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

See "The Dow Hour of Great Mysteries" on TV.

New Products cont.

Motor Overload Protection In Expansion Valve

>>> ADDITION of a pressure limiting expansion valve to the 718 Series of compact valves is announced by Detroit Controls Division of American-Standard. The pressure limiting feature provides motor overload protection in refrigeration and air conditioning systems during pulldown or abnormal operation.

The pressure limiting device, described as simple, rugged and accurate, is a patented feature of the new valve, and eliminates the necessity of a second charged element. The pressure limiting device, comprised of a spring and two retainers, replaces the push rod normally found between the diaphragms of a pressure limiting valve. As suction pressure rises above the maximum operating pressure of the valve, the spring compresses, shortening the distance between the diaphragms. In effect, this provides a "collapsible push rod."

Conversely, when suction pressure is lower (within normal operating range), the spring returns to its predetermined length. This allows the valve to operate as a standard thermostatic expansion valve.

Detroit Controls' new pressure-limiting expansion valve in the compact series is designated 718-PL. It is

available with internal or external equalizer and may be ordered either for R-22 or R-12 refrigerant. The 718-PL can be furnished with 10, 30 or 45 lbs. M.O.P. springs.

Capacities for internal equalizer models using R-12 are ½, 1 and 2 tons; internal equalizer models using R-22 have capacities of .8, 1.6 and 3.2 tons. External equalizer models for R-12 use are in 1 and 2 ton capacities; available in external equalizer models for use with R-22 are capacities of 1.6 and 3.2 tons.

Redesigned Line Of Squirrel-Cage Motors

A NEW line of large squirrel-cage motors, 250 through 1000 horsepower, is announced by Wagner Electric Corporation, St. Louis, Missouri.

Built for heavy duty industrial applications, these motors feature extremely compact, smoothly contoured, fabricated steel plate enclosures that have great mechanical strength and high resistance to corrosion. For safety and ease of handling, four lifting eyes are built-in as integral parts of the frame ends. Mounting space required is materially reduced by positioning the feet under the overhang of the frame.

The flat steel endplates are built in two sections, facilitating disassembly for bearing inspection, if required.

The enclosure is completely drip-proof with ventilating openings so located and shielded as to provide essentially splash-proof protection.

Pre-formed coils of copper strip are precisely shaped to make up the uniform, well-braced winding. Coil ends and lead connections are permanently brazed. The insulation system is carefully balanced to give mechanical and electrical strength with good resistance to heat, moisture and aging.

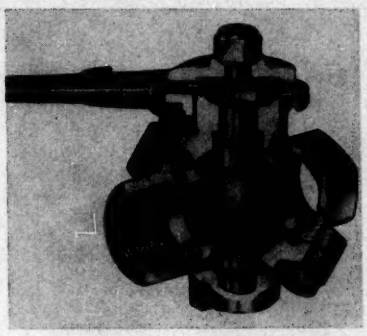
Both the stator and rotor core are constructed to permit radial as well as transverse circulation of air for efficient dissipation of heat.

Available voltages are 440, 550, 2300 and 4160 volts, 60 cycles. The entire range of ratings, 250 through 1000 hp, can be supplied with full load speed of 3500, 1750 or 1160 rpm; 870 and 690 rpm motors are available through 700 hp, and 575 rpm motors through 500 hp.

Sleeve bearing models can be furnished in the entire range of ratings and speeds; ball bearing models through 400 hp, all speeds, and through 900 hp at some of the lower speeds.

Ball Valves

RESPONDING to an estimated 50-fold increase in the use of ball valves since the war, the valve division of Besler Corporation now offer their field-proven ball valves to the general industrial market. According to Timothy Colvin, president, these valves have been developed through nine years of rugged and abrasive use on agricultural equipment, and some 40,000 are in service. Prices are highly competitive.



Formerly known in different markets as the "Bes-Val", or "Flo-Rul" valve, the name has been changed to "Hi-Flo". While previously manufactured only in 3/4" and 1" sizes, valves from 3/8" to 2" have been added for the industrial market and 3", 4", 6" and 8" sizes will be available after the first of the year. Operating pressures extend to 1,000 psi.

The Hi-Flo valve offers no restriction to flow and creates no turbulence and no pressure drop. Dual

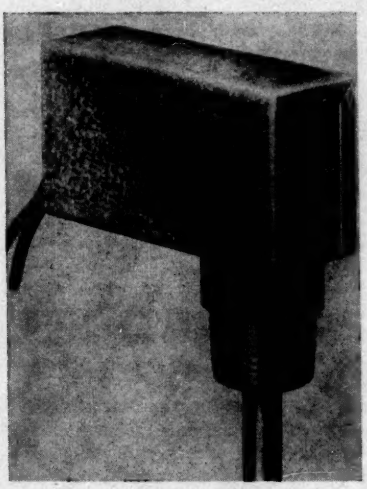
seals are used, making the valve universal in installation; and, it may be mounted in any position. Hi-Flo construction is so balanced that the effort of turning the handle varies very little with substantial increases in line pressures. Offered with a ratchet, for a slightly higher price, one pull opens the valve and one pull closes it: a particular advantage for difficult-to-reach spots, or for remote control where a cable or rod may be attached to the valve handle for easy operation.

The Hi-Flo valve is stocked in bronze and aluminum; stainless steel and ductile iron versions may be obtained on order. Seats are of nylon, Kel-F®, and synthetic rubbers. Seals are of selected synthetic rubbers to meet specific requirements. Balls are hard chrome plated in the bronze and iron valves, and hard anodyzed in the aluminum valves. The wearing parts may be replaced quickly and easily if necessary.

Distributor and dealer inquiries are invited. Illustrated literature is available.

Thermostat

THE new Model S-1S thermostat is a miniature size differential expansion type control having 8 standard ranges up to 1150°F. It incorporates



a snap-action switch rated 5 amp 125-250 v a.c., 30 amp 30 v d.c., and is available in the open style or with a NEMA 1 type enclosure.

Temperature settings are made with internal adjusting screw. Units are for local mounting and may be furnished with flanged or threaded fittings.

Ice Machine Cleaner

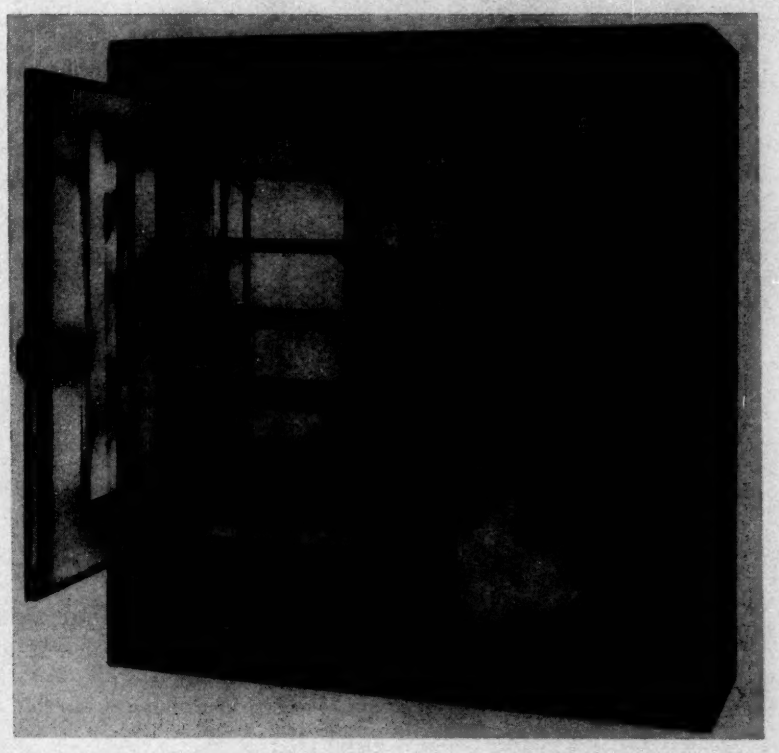
A FAST-ACTING, non-staining liquid acid is being recommended for removing scale deposits from ice making machines.

The product, Calgon Liquid Ice Machine Cleaner, is made from a food grade phosphoric acid. It is packed in 10 ounce, quart, and gallon plastic bottles. In addition to cleaning ice making machines, it may also be used to clean coffee urns and steam irons.

Steps in the cleaning cycle are as follows: First, flush out all loose sediment, refill with fresh water and add the Ice Machine Cleaner to the water. (One 10 ounce bottle will treat systems with up to 3 gallons of water.) Allow acid solution to circulate until equipment is clean—an average time of 30 minutes is required. Drain and flush with fresh water to remove cleaner.

For additional information, write Jobber Sales Division, Calgon Company, Hagan Center, Pittsburgh 30, Pennsylvania.

"Reach-In" Test Cabinet



»» LABLINE, Inc., Chicago, has announced production of an improved reach-in environmental cabinet designed specifically for making industrial testing. Comes in two temperature ranges: 40°F to 140°F, and room to 140°F.

The new unit provides 60 square feet of shelf area on five shelves, yet only requires 15 square feet of floor space. It eliminates the need for multiple, bench top cabinets. Comes completely set-up; no assembly required.

The environmental cabinet is designed for easy access to the test samples and is ideally suited for laboratories in the industrial, food, petroleum and petro-chemical fields. The cabinet is useful for conducting aging tests, for the preservation and storage of samples and for specific gravity determinations.

Exclusive features include all-aluminum interiors, fluorescent lighting, dual thermostats, double doors, adjustable shelving, and no internal ducts or louvres. Each of the five aluminum shelves measures 6 ft. by 2 ft. The unit has a quadruple, Thermo-Plate heater with built-in air diffusers that assure uniform temperatures throughout the chamber.

Double-wall construction with 3-inch glass wool insulation is used throughout. Doors are mounted on refrigeration-type hardware with dual gaskets for effective sealing. The cabinet is finished in an attractive, neutral color.

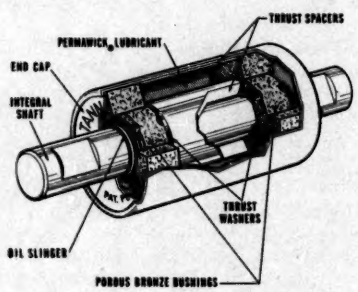
Floor Load Refrigerators

CREATED to increase volume storage, feeding and serving, a new group of Victory V-line Floor Loader refrigerators, freezers and warmers have been designed to receive standard utility racks. These new, all-stainless remote units will take almost any size utility rack and they come in 1-2-3- and 4 section models.

They are available as standard and pass throughs. The racks roll easily into the refrigerator because special adjustable guide bars position the rack as it enters. No need for perfectly level floors. Completely eliminates adjustments usually associated with refrigerators using racks. All refrigerator and freezer models have full length mullion coils. Specially designed door hinges elevate the doors as they open thus eliminating gasket wear on the floor. This assures positive locking and seals the door to the floor when closed.

Shaft Bearing For Blower Wheels

A NEW shaft bearing assembly for blower wheels, with a life expectancy several times that of conventional roller ball or needle bearing devices runs quieter and never needs reoiling.



The bearing can be supplied with its integral shaft contoured to accept the customer's fittings. It is in production by the Tann Bearing Company, division of Tann Corporation, Detroit. Patents have been applied for.

The sealed bearing has a lifetime recirculatory oiling system. It will not leak oil and is highly resistant to invasion by dirt or moisture, Tann officials report. Base life of at least 20,000 hours is predicted.

The current assembly is designed to handle radial loads of 25 to 30 pounds at speeds of 500 to 4,000 rpm with moderate thrust loads.

It is also recommended for applications where bearing noise or conducted resonances are problems, as in packaged air conditioners or sheet metal ductwork, and in locations with high ambient humidity or abrasive atmospheres, as in home laundry equipment and industrial sanding or exhaust equipment.

Synthetic Oil For Extreme Low Temperature

A SYNTHETIC oil, designed for extreme low temperature applications such as chart drives, clock movements, meteorological and aircraft instruments is being marketed by the Lehigh Chemical Company, Chestertown, Maryland.

Called Anderol L-423, this light viscosity diester oil features a pour point of below 105°F. and a viscosity at 90°F. of only 5,000 C's. These excellent properties combine with good oxidation stability and exceedingly low evaporation to produce a superior lubricant that meets the requirements of low starting and running torques over a temperature range of -100°F. to 250°F.

Completely compatible with ordinary lubricants, Anderol L-423 offers penetration comparable to the finest penetrating oils.

Book Review

RADIATION TECHNOLOGY IN FOOD, AGRICULTURE & BIOLOGY. By Norman W. Derosier, Ph.D. and Henry M. Rosenstock, Ph.D. Published by AVI Publishing Co. Available from Nickerson & Collins Co., 433 N. Waller Ave., Chicago 44, Ill.—21 Chapters—425 pages. Price: Domestic $12.50—Foreign $13.50.

Two outstanding leaders in research in radiation have collaborated in presenting the basic principles on ionizing radiations and their present and probable future applications in food processing and preservation, and in horticultural, agricultural and biological research. Here for the first time is the complete story beginning with the nature of radiation and its relation to nuclear chemistry. Having laid the groundwork, the book leads on to what radiation does to single cells, plants, animals, and food, and in promoting useful chemical reactions.

Then the practical details of the technology of radiation are set forth as applied to food, agriculture and biology. The latest commercial equipment, the measurement and control of dosage, safety measures, and even detailed cost studies are presented, making the book complete and authoritative.

Effects of Monosodium Glutamate on Food Flavors Investigated

»»» SEVERAL moot questions about use of monosodium glutamate in foods as a flavor adjunct have been answered by studies in USDA's Agricultural Research Service.

The more important questions were: What differences in foods affect detection of glutamate and preferences for amounts added? Does it mask or reduce off flavor that may develop in frozen foods? How is added glutamate affected by canning? The information was needed by both manufacturers and users of glutamate. The Glutamate Manufacturers' Technical Committee contributed financially to the project.

In the Western Utilization Research and Development Division, Albany, Calif., Helen L. Hanson, Marian J. Brushway, and Hans Lineweaver have obtained answers by taste-panel and chemical research on this by-product of the beet-sugar and cereal-milling industries.

They observed that the amount of glutamate naturally present in a food affects the flavoring value of added glutamate. Chicken broth and pork sausage, for example, are low in natural glutamate, and added glutamate is readily detected in these foods. Peas, paste made from poultry livers, and tomatoes are examples with relatively high glutamate contents and in such foods addition of the flavoring adjunct has less affect. For food manufacturers, natural content of glutamate can serve as a guide to amounts to be added.

Levels of thickening agent, fat content, and seasonings that are normally used do not greatly influence ease of detection. Of foods used, chicken broth was the one in which it was most readily detected, but addition of thickening, fat, and sea-

sonings interfered only slightly with detection. The same conclusion was reached in studies with other foods.

The addition of glutamate to fried chicken, turkey a la king, pork sausage, and other foods that were frozen and held at 10° and 20°F. did not reduce the rate of development of off flavor, nor did it mask the off flavor in taste tests.

In several canned foods studied, glutamate was retained without loss. Its flavoring effect did not differ when added before or after canning. The advantage of addition before canning lies in uniform distribution of the glutamate, especially in canned foods with several ingredients.

The preference tests conducted showed that foods with added glutamate were generally preferred over those without it. In no case was a sample of food with added glutamate considered to be inferior.

Originally an Oriental product, monosodium glutamate has been made and sold under various trade names for use in home and commercially prepared foods during the past 15 to 20 years in the United States.

Frozen Food Packers Announce Convention Committee, Dates

››› THE convention committee of National Association of Frozen Food Packers was announced by W. F. Edwards, president of the association.

Ansley Watson, Pasco Packing Co., Dade City, Fla., was named chairman of the 20th Annual Convention & Exposition which will take place March 5-8, 1961, in Dallas, Texas. Also named to the Committee were:

James R. Agen, Cascade Frozen Foods, Inc., Burlington, Washington

F. Webster Browne, Snow Flake Canning Co., Brunswick, Maine

H. F. Lochrie, Birds Eye Div., General Foods Corp., White Plains, N. Y.

Mr. Watson, in accepting the chairmanship, said, "The Association will reach a milestone in its growth at this next convention and exposition. Twenty years will have passed since the NAFFP was first incorporated. The Committee will endeavor to make this convention the best ever held."

Lawrence S. Martin, secretary-manager of the NAFFP, indicated the Association's conventions have grown to such size that all four major Dallas hotels will be used. Besides the Statler-Hilton, which is to be used for the exposition and the meeting sessions, the Sheraton Dallas, the Adolphus and the Baker will be fully utilized.

Tenney Turns 46-Foot Semi-Trailer Into All-Climate Environmental Lab

››› A UNIQUE climate simulator that withstands practically any ground weather while generating extreme environments of its own has been delivered to White Sands Proving Grounds by Tenney Engineering, Inc., Union, N. J., for testing missile parts on the launch pad.

Housed in a 30-ton, 46-foot semi-trailer, the climate simulator can be moved to any point that wheels can travel. It can ignore outside temperature as cold as an Arctic 5° below zero, or a tropical 115° above, or rainfall as much as two inches an hour, or a desert sand and dust storm of 75 miles an hour, or solar radiation of 400 Btu per square foot an hour while engineers create and hold the following conditions:

Temperatures of −85° to +200°F., relative humidity of 20 to 100 per cent, and air flow of 600 to 6,000 cubic feet per minute.

Robert H. Brown, Tenney's vice president for sales, said the mobile giant, self-contained with its own 400-kv diesel electric generator, cost approximately $150,000.

"The value of this unit to the missile and space program," Mr. Brown said, "is that it can be moved from site to site for use when and where needed. If engineers have any doubt as to how a rocket part will function, they can promptly test it under a wide range of conditions encountered in flight, a far surer, faster and more economical way of achieving a successful launching than guessing."

Tenney Engineering, Inc., manufacturers of environmental test chambers, produces chambers in many different sizes.

Super Wedge Drive Catalog

››› THE opening pages of the new 24-page Maurey Catalog SW-1 explain how the Maurey Super Wedge Drive reduces drive size as much as 50%, and permits drive cost reductions as substantial as 20%, with no loss in horsepower capacity. Primarily, however, the book is a handy manual of the engineering data essential to proper drive selection and installation. Drive selection tables, horsepower ratings, sheave dimension tables, and installation instructions covering belts, sheaves and bushings make the catalog SW-1 a book of genuine practical value for the machine designer and the production man.

The inherent advantage of the Maurey Super Wedge Drive, the catalog explains, is its ability to handle big power loads with smaller sheaves, narrower belts, fewer belts, less weight and less space than has heretofore been possible. New, high strength metals in the sheaves, and tough new fibers and synthetic rubbers in the belts provide sinew without bulk. Deeper sheave walls make maximum contact with the deep sides of the narrower belts for more effective power transmission. The extreme flexibility of the slim belts permits full drive efficiency over shorter centers.

Copies of the new catalog SW-1 are available on requests addressed to Service Division, Maurey Manufacturing Corporation, 2907 South Wabash Avenue, Chicago 16, Illinois.

Top Executives More Interested In Exhibits Than In Technical Sessions At Nation's First Fleet Maintenance Exposition

»» COMMERCIAL and industrial exhibits are attracting even more top executives to attend the nation's first Fleet Maintenance and Management Exposition than are plans for the technical sessions and workshops.

Seventy-one per cent of the top executives in companies operating motorized fleets say they are interested in seeing, under one roof, all of the latest products, services and management methods available to assist them in the operation and maintenance of modern fleets.

Plans for technical seminars and workshops, based on subjects suggested by fleet owners themselves, placed second to the exhibits in executive interest—67 per cent.

The survey was conducted by the marketing research firm of John T. Fosdick Associates in an effort to forecast probable attendance at the Fleet Maintenance Exposition scheduled for the New York Coliseum, December 5 through 8. The show is sponsored by the Private Truck Council of America, Inc.

The Exposition will feature exhibits of operational tools such as radio communications, accounting procedures, etc. plus equipment, vehicles, tools, supplies and services and a three-day Workshop Seminar Program.

The independent Fosdick research study shows that top executives are not only interested in seeing the exhibits but also in the opportunity to discuss with factory engineers, designers and technicians their own particular problems in quality control and design of methods and equipment.

Sixty-seven per cent of these same officials also indicated active interest in attending the series of technical seminars on fleet operation, maintenance and repair which will be held in conjunction with the Exposition. Scheduled from Noon to 6 pm., December 5 through 8, the Seminars will offer the latest procedures, methods, and techniques in fleet maintenance.

1960 IAICM Convention Schedule Completed

»» A NEW format for the 1960 International Association of Ice Cream Manufacturers Convention to be held in the Conrad Hilton Hotel, Chicago, Illinois, October 31-November 2, has been announced by Robert H. North, executive secretary.

The new format, which was approved by IAICM's executive committee and board of directors, will enable IAICM members to attend all the sessions and have ample opportunity to view the exhibits at the 1960 Dairy Exposition. The theme of this year's exposition is "Showcase 60, Products-Methods-Profits."

The following activities are scheduled in the Conrad Hilton Hotel unless indicated otherwise:

SUNDAY, OCTOBER 30

9 a.m.–5 p.m.—Registration—closes Wednesday noon

Afternoon—Ladies' Hospitality Center opens—closes Wednesday noon

Evening—Sunday Night Get-together and Entertainment (A special event of interest to everyone in the dairy industry is being planned.)

MONDAY, OCTOBER 31

9:30 a.m.—IAICM Annual Meeting

10:30 a.m.—First Session—Management Council

Afternoon—Open for Dairy Exposition

TUESDAY, NOVEMBER 1

7:30 a.m.—Breakfast and Second Session—Merchandising Council

10:30 a.m.—Third Session—Production and Laboratory Council

Afternoon—IAICM-ICMI Board of Directors Meeting
—Open for Dairy Exposition

Evening—College Awards Night Dinner—Terrace Casino, Morrison Hotel

WEDNESDAY, NOVEMBER 2

7:30 a.m.—Breakfast and Joint Session of IAICM & MIF Accounting Councils—Palmer House

10:30 a.m.—Joint IAICM-MIF General Session—Palmer House

Afternoon—Open for Dairy Exposition

Plans for a joint Dairy Night Social Event on Wednesday evening are being considered.

To assure accommodations, IAICM members and guests are urged to make their hotel reservations promptly on the official IAICM form, which has been mailed to them. IAICM's pre-registration convention forms will be mailed during August.

A Coupling In

»» REPAIRMEN arriving at lower Rockefeller Plaza were spared the icy stare of the headwaiter at the Promenade Cafe when they set about repairing leaking corroded pipes under the terrazzo flooring of the popular outdoor restaurant. The entire job was completed in record time at night, without a tureen being tumbled or a diner being disturbed.

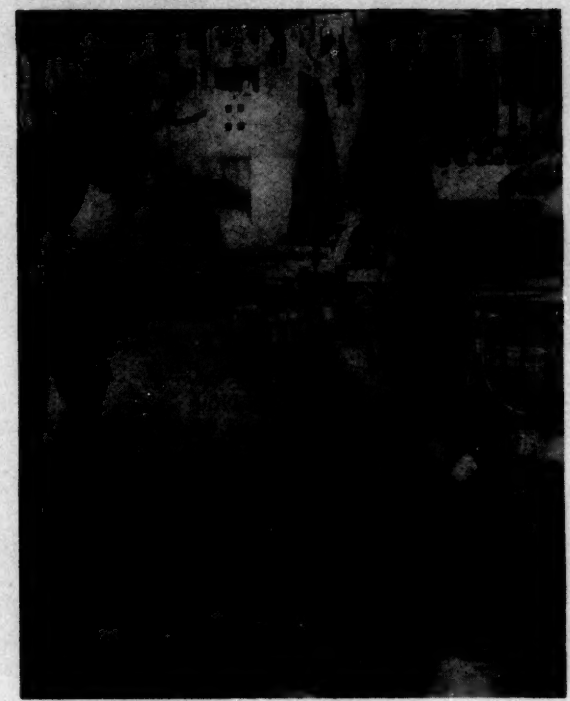
The lower plaza at world-famous Rockefeller Plaza is unique for many reasons, not the least of which is the fashionable Promenade Cafe, an outdoor restaurant during the summer months, which becomes transformed in winter into the popular Outdoor Ice Skating Pond. Five miles of piping lie hidden under the terrace flooring of the cafe, and nippy autumnal breezes coincide with the annual flooding of the area when "Tea for Two" is replaced by "The Skater's Waltz".

During the regularly scheduled inspection of the skating-pond's supply return and reverse headers, the superintendent discovered leakage of the headers underneath the replaceable pan located around the edge of the dining area. Since hundreds of diners take advantage of the superb luncheons and dinners served daily, the problem was posed as to how to effect repairs without interrupting dining service. Since the official opening ceremonies were but one month away it appeared obvious that welding of the 240 headers could never be finished in time without completely closing down the restaurant.

Buensod-Stacey Corporation, New York contractors specializing in "problem" jobs were called in, and a rapid analysis of the work required was made. They assured Rockefeller Center officials that the pond would be in first class working condition and ready to operate on schedule, and furthermore that there would be no interruption of the restaurant's operations.

After the terrazzo had been cut back, Buensod-Stacey confirmed their suspicions that the original unions were corroded and leaking severely. Working from 11:00 pm. to 11:00 am., a new header was prefabricated in the shop, the ends of the pipe were cut back in place to where they were still good, and then threaded in place. To avoid time-consuming welding, two hundred and forty Style 65 rubber-packed Dresser couplings were quickly and easily con-

Time Saveth Brine



In the background, Prometheus brings fire to earth, while in the foreground the workman supplies the finishing touches to ice rink piping for winter pleasure.

The repair job finished—and just in time for brunch! Dresser couplings are staggered for space considerations. Note limited working area.

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Genuine Ozite pipe covering insulation installs easily on curves, fittings, straight pipes or valves . . . stops wasteful heat absorption effectively and permanently. Ozite insulation also helps maintain uniform temperature and increase your equipment's refrigerating capacity. Try Genuine Ozite!

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nected to the new header while waiters set up for lunch as usual. The terrazzo was then replaced, and well in advance of the deadline, the brine was once again circulating in the system in anticipation of flooding.

Years ago, athletes had to rise at dawn to seek out early ice thick enough to puck practice. Nowadays it's the contractors maintaining the night patrol who help provide winter sport for the New York's figure skaters.

Milwaukee RR Expands Fleet of Refrigerated Vans

»» THE Milwaukee Road has received the first of an order of 25 new mechanically refrigerated vans for its expanding Flexi-Van fleet, W. W. Kremer, vice president-traffic, announced.

All of the vans in this order are expected to be in service by the end of the month.

In addition, 12 insulated vans already in Milwaukee Road Flexi-Van service are being converted into refrigerated vans with the installation of mechanical refrigeration units. These will bring the total of such units to 37.

Kremer said the refrigerated vans are equipped with dual temperature controls so that they can also be heated for the shipping of perishables during cold weather. Thus commodities which call for handling under special temperature control can be transported in the vans the year around.

In addition to the new Flexi-Van equipment, the Milwaukee has also taken delivery of 15 conventional piggyback trailers, each 35 feet long and with a capacity of 40,000 pounds. These are being operated in a manner similar to Flexi-Van trailers except that the latter slide off their highway wheels and into position on the specially-built Flexi-Van flatcars, whereas the conventional trailers ride the piggyback flatcars with their wheels permanently in place.

The new trailer-on-flatcar equipment is being obtained to meet the steadily increasing demand from shippers for this type of service, Kremer said.

The acquisition of this equipment represents the fourth time the Milwaukee Road has expanded its Flexi-Van fleet since it started the service about a year and a half ago. The railroad plans to acquire more such equipment as traffic needs develop, Kremer asserted.

Fifteen of the new mechanically refrigerated Flexi-Van units contain a laminated lining of fiber glass and plastic which makes for easy cleaning of the interior. These vans also are fitted with stainless steel rails, installed lengthwise, with hooks for the hanging of meat. When not in use they can be turned up against the ceiling.

Capable of temperatures as low as zero, these units are also well suited for the handling of frozen foods.

Propane gas is used to fuel the new refrigeration mechanisms, each of which will operate 90 hours without refueling.

With delivery of the 25 new refrigerated units, the Milwaukee Road's Flexi-Van fleet will include 215 vans, as well as 115 bogies (rear wheel assemblies, detachable from the vans for loading) and 64 Flexi-Van flatcars.

Kremer said that the mechanically refrigerated vans broaden still further the versatility of the Milwaukee Road's Flexi-Van equipment, which already includes conventional vans with end doors and others with both side doors and end doors, open top vans with end doors, high volume vans with inside height of 9 feet compared with the usual 8 feet, and seagoing vans equipped with special gear to load aboard ship.

Pennsalt Adds Isotron 13 To Its Line

»» PRODUCTION of Isotron 13 for low temperature environmental refrigeration applications has been started by Pennsalt Chemicals Corporation. The sixth in the company's line of fluorocarbons, Isotron 13 will be available in 80-lb., 23-lb., and 5-lb. cylinders.

Isotron 13 (monochlorotrifluoromethane) can be used to produce temperatures below −100°F. It will be particularly useful in low-temperature research and testing where exceptionally low environmental temperatures are desired such as for aircraft and missiles, electronics, automotive, petroleum and chemistry.

Pennsalt refrigeration technicians report that Isotron 13 will have the same exacting control for low-moisture content as for its other Isotrons and that this standard is protected by factory sealing.

Additional information on Isotron 13 is available from Pennsalt representatives or by writing to Isotron Department, Pennsalt Chemicals, Corp., 3 Penn Center, Philadelphia 2, Pa.

Allied Chemical To Build Two New Plants—One In Mexico

»» PLANS to build a large new plant at Elizabeth, N. J. to produce its "Genetron" line of fluorinated hydrocarbon refrigerants and aerosol propellants were revealed by Allied Chemical's General Chemical Division.

The plant will be built on a site at its Elizabeth Works, where the Company now produces sulfuric acid for industrial consumers in New York and New England and has bulk storage facilities for "Genetrons".

The new "Genetron" facility, the Company's third such plant, will increase General's over-all capacity by more than a third. Other plants are at Baton Rouge, La. and Danville, Ill.

Initial products to be produced are the three primary refrigerants and aerosol propellants: Genetron 12 (dichlorodifluoromethane) Genetron 11 (trichloromonofluoromethane) and Genetron 22 (monochlorodifluoromethane).

Construction will begin immediately and is scheduled for completion early in 1961. "The Elizabeth, N. J. site has been chosen to enable us to provide maximum service to consumers located along the eastern seaboard," Frank J. French, General Chemical Division President noted.

Plans to build plants for the production of hydrofluoric acid, carbon tetrachloride, and fluorinated hydrocarbons in Monterrey, Mexico, have been formulated by Celulosa y Derivados, S.A., Monterrey, N.L., Mexico, according to a statement by Miguel G. Arce, president of Celulosa. Sr. Arce was pleased to announce also that General Chemical Division, Allied Chemical Corporation, would provide technical information for the project.

In making this statement, Sr. Arce said that the plants, which it is anticipated will be completed in the first part of 1961, will have sufficient capacity not only to supply current and estimated future needs of Mexico, but also to supply these products under Mexican label throughout Latin America. None of these chemicals is currently produced in Mexico except for hydrofluoric acid, made in limited quantities.

Sr. Arce emphasized that all of the raw materials, utilities, and labor for the new plants will be supplied from the Monterrey area or from other Mexican sources.

Armstrong Announces Expandofoam Insulation

»» BETTER performance and more economy can be obtained in refrigerated equipment using a foamed-in-place urethane insulation distributed by Armstrong Cork Company's Insulation Division.

The new material called Armstrong Expandofoam is a chemical product supplied as two liquid components which the equipment manufacturer can mix and expand into the equipment cavity to form a rigid, efficient urethane foam.

Pouring Expandofoam into the cavity of a metal refrigerator door by means of a machine which mixes and foams the material. The mixture fills the cavity and solidifies into an insulation material that possesses high thermal efficiency, strength and toughness, and vapor and moisture resistance.

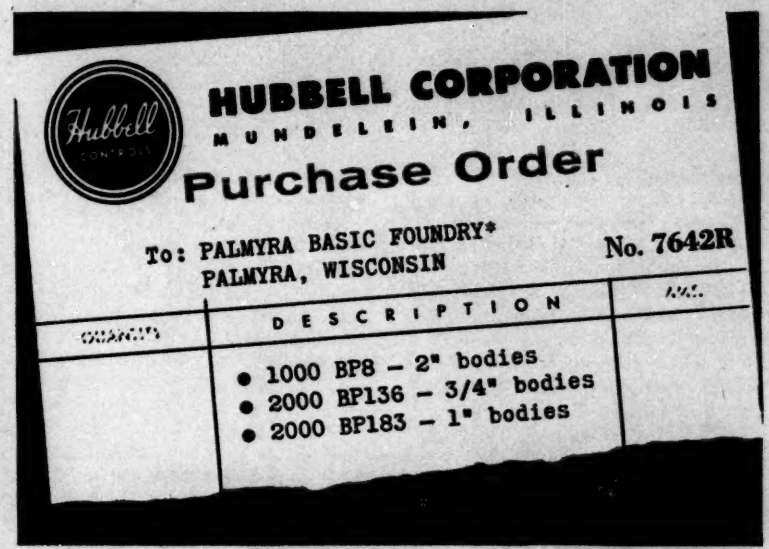
The high thermal efficiency of Expandofoam allows wall thicknesses to be cut almost in half, so 50 per cent less insulation is required. The strength and toughness of Expandofoam allow cabinets to be redesigned, incorporating substantial economies by using lighter parts and eliminating framing members.

Expandofoam's high moisture and vapor resistance eliminates moisture infiltration problems and the expensive sealing methods often needed to combat them. By redesigning around Expandofoam, interior dimensions can be enlarged without expanding exterior measurements, and extra durability and trouble-free service can be built into cabinets.

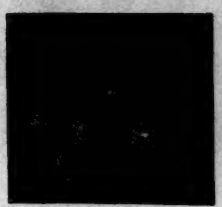
The new foamed urethane is composed of uniform, small, closed cells, and has unusual toughness and strength. Components are low viscosity for easier handling and more thorough mixing and can be mixed by hand or machine.

The liquid components are produced by the Chemical Division of General Tire and Rubber Company, Akron, Ohio, in cooperation with Armstrong research. The formulation can be varied to provide different combinations of conductivities, densities, and degrees of strength and toughness to meet the insulation and design requirements of a wide variety of types of refrigerated equipment.

Armstrong also offers qualified engineering service to work with manufacturers in the design of refrigerated equipment, development of the most efficient Expandofoam system for each individual requirement, and technical evaluation of experimental or production models. Armstrong is able to foam customer equipment at its Research and Development Center, Lancaster, Pa., on production type equipment.



Nothing is left to chance . . . Hubbell makes its *own* castings to guard the quality and superiority of its controls. *Every* casting must measure up to Hubbell standards.



This inside control of our own foundry craftsmanship is appreciated by Refrigeration Engineers. And rightly so. The proof of the pouring—slower, careful manual pouring—is in the testing. And the proof of the testing is clearly evidenced by the name Hubbell on engineering drawings everywhere.

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CONTROLS

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"Castings to finished controls . . . every inch HUBBELL"

Air Conditioning Helps Child Behavior Studies

A CONTROLLED atmosphere in the new $1 million Program Building at the Merrill-Palmer Institute in Detroit, Mich. will eliminate one of the variables in child behavior studies, according to David J. Williams, development director of the Institute.

"No longer will we have to allow for changing attitudes and moods due to the weather," Mr. Williams said. "This should contribute significantly to the quality of many of our long-term studies."

When completed this spring, the completely air conditioned new building will house class rooms, faculty and administrative offices, nursery school facilities, observation booths, a library, play therapy rooms, dining room, and other specialized facilities. It also has a play area.

An average of 100 carefully-selected students spend part of their junior or senior college years, or a full graduate year, at Merrill-Palmer studying all phases of human behavior. In addition, educational opportunity in the fields of human development and family and community life are provided for a variety of professional and lay groups.

Last year over 3700 individuals participated in the Merrill-Palmer educational program. An important part of this program is the observation of infant and child behavior, which is sometimes affected by discomfort caused by variations of temperature and humidity in the activities areas and observation booths. "With air conditioning, these variables will be removed and we will be better able to observe behavior under consistent conditions," Mr. Williams said.

He cited three other reasons for air conditioning the building:

(1) Greater use of space, particularly in the inside and underground rooms.
(2) Frequency of well-attended meetings which demand revitalization of the air.
(3) Easier maintenance of interior walls and furnishings.

Additional space was saved by using a Carrier absorption refrigerating machine as the source of chilled water. This unit saves boiler space by operating on district steam supplied by the Detroit Edison Company and also eliminates the need for an electric motor.

After 40 years of operation, the new building designed by O'Dell, Hewlett and Luckenback Associates, local architect-engineers, is the first specifically made to meet the school's needs. Darin & Armstrong, also of Detroit, is the general contractor.

U. S. Electrical Motors EVERSEAL Literature

»» LITERATURE describing the new U. S. "Everseal" silicone rubber protection against adverse environments for windings of form-wound motors, 150 hp. and up, is now available from U. S. Electrical Motors Inc., Los Angeles and Milford, Conn. The new literature supplements previously available literature on U. S. Motors' other method of "Everseal" protection—encapsulation in random-wound motors up to 125 hp.

"Everseal" protection, whether by encapsulation or by the silicone rubber process, prevents damage to windings in adverse environments that ordinarily mean rapid deterioration and replacement—thus not only saving replacement costs, but the cost of production interruptions due to motor shutdowns. "Everseal" protects windings against chemicals, abrasion, moisture, heat, weathering, vibration, oxidizing, fungus, salt air, spray, oils, detergents, and many other adverse

Stop leakers for good with

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For EVERY USE and SERVICE CONDITION. Withstands temperatures to 500°F.—Pressures to 6000 psil Not affected by gases, petroleum products, chemicals or steam and will not harden—joints sealed for years are easily broken. Economical—one compound for ALL needs.

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Marlo Comfort Conditions Two New Georgia Hospitals

››› TWO new hospitals in Georgia have been equipped with year-round air conditioning systems for the comfort of patients and staff members. They are the Wayne County Hospital at Jesup, and the Decatur Memorial Hospital at Bainbridge. In both cases, Marlo air conditioning products were selected to provide winter heating and summer cooling in these modern buildings. A total of 244 individual pieces of Marlo equipment were installed, including 212 Seazonaire remote room units, two central station units, 12 unit heaters and 18 coils.

Arthur W. Bell Is Named Industrial Relations Director For Frick Company

››› FRICK Company, manufacturers of refrigeration, air conditioning, farm and portable sawmill equipment, has appointed Arthur W. Bell as director of Industrial Relations, it has been announced by Matthew M. Gouger, executive vice president of the company.

A. W. Bell

Mr. Bell has more than ten years experience in the fields of personal and industrial relations. Prior to joining Frick Company, Mr. Bell was for six years Supervisor of personnel relations for the Vertol Aircraft Corporation, Morton, Pa.

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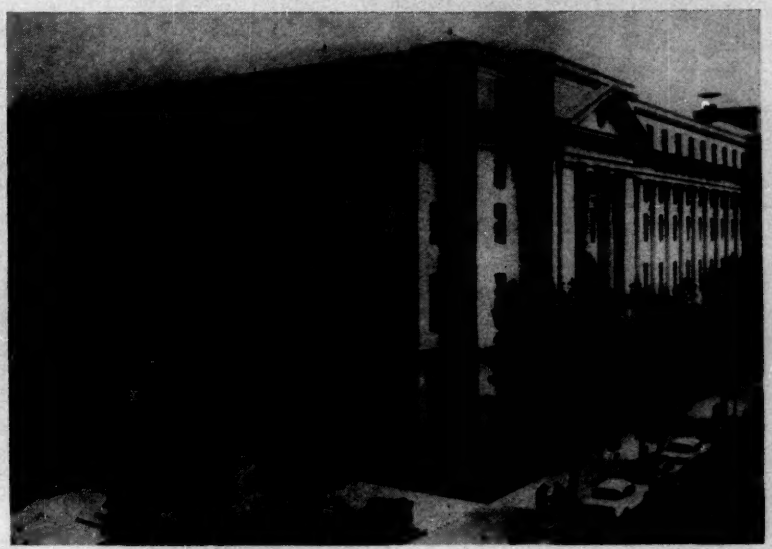
Previously he served as director of Industrial Relations for the Pacific Airmotive Corporation, Burbank, Calif., and as personnel manager of the Commodore Hotel, New York City.

He was graduated from Wesleyan University in 1941 and from the New York University School of Law in 1950.

1100 Tons of Cooling In Newark Federal Building



››› JOSEPH A. Rosenthal, P. E., President of Engineers Incorporated, Engineers and Designers of Newark, announces that Newark's 30-year old Post Office and Federal Building is having some changes made that will modernize and up-grade the quality of the structure.

The project, now in its final design stage, is a complete air-conditioning installation to cost approximately $1-3/4 million. The significant fact about this new system is that it will be almost invisibly installed without major—and costly—structural changes. The building is occupied by the Post Office, Federal Courts, Federal Bureau of Investigation and other Governmental Agencies.

Rosenthal said the installation consists of a high-velocity distribution system using six and eight inch ducts and installing air handling units in existing attic spaces. The 1100-ton capacity compressors are installed in the basement and the cooling tower on the roof of the third story, at the rear of the building, in a location which is concealed by existing walls.

Engineers Incorporated has arranged the new system to permit year-round heating, ventilating and air conditioning and provides for simultaneous heating and cooling in different zones. Controls for the entire system are located in the basement for ease of maintenance.

Capital Equipment Leasing Plan Announced By American-Standard

››› A NEW "total" leasing plan covering the complete line of American-Standard air conditioning, industrial and power equipment products has been announced by American-Standard Industrial Division, Detroit 32, Michigan. Speaking for the division, John F. Tobin, vice president, marketing, said in explaining the reasons for establishing the plan, "Leasing has become an increasingly popular method of financing in the last decade. Leasing allows companies to acquire control over almost any kind of equipment without capital outlay on their part."

The new plan is described as "total" because it includes all types of non-expendable equipment in the full range of sizes produced by the division, whether the purchased goods be standard off-the-shelf items or a complete custom installation. American-Standard Industrial Division is a leading manufacturer of industrial air conditioning and air handling equipment, air polution control equipment, fluid drives, heat transfer products, surface condensers, steel boilers and industrial products.

This leasing plan retains for the purchaser all the advantages of an outright purchase, Mr. Tobin said. Standard construction and performance guarantees are part of the Industrial Division lease package. Mr. Tobin pointed out that an option to buy is a standard part of the contract. Each lease is individually tailored to suit the needs and desires of the customer with regard to terms and duration of contract, he said.

Heat Transfer Equipment

"HOT SPOT" PREHEATER

FOR HEAVY OILS AND LIQUIDS IN BULK STORAGE

Preheats fuel oils and other liquids to proper flow temperature before entering the suction line.

Heats with Steam or Hot Water

The Rempe "Hot-Spot" does an efficient preheating job . . . releases more BTU'S from fuel oils. Special flow accumulator causes liquids to pass over heated coils. Takes the load off the suction pump.

All steel shell and coil assembly—14" or 16" shell diameters—Connections furnished correct length for any tank diam.

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Coil illustrated is the Rempe Hi-Therm Grid designed for fast load pickup on all liquid heating jobs. Coil style is an exclusive Rempe Pattern. Available in steel, copper and stainless steel.

Maximum prime surface increases fluid turbulence making the Rempe Grid far superior to plate type coils.

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137 Years Service To Recold Corporation

Six Recold Corporation employees with a combined 137 years of service to Recold were recently honored by the Los Angeles Company. Pictured are: left to right, standing, Elton Nodine, 25 years; Leonard Bass, 20 years; Louis Grussmeyer, 26 years; Richard Jakob, 28 years; Agnes Faessel, 10 years. President H. T. (Hy) Jarvis, seated, has been with Recold for 28 years.

»» SIX employees with a combined service time of 137 years were honored by Recold Corporation of Los Angeles recently in a ceremony at the air conditioning and refrigeration equipment firm.

The service awards were started by H. T. (Hy) Jarvis, president, a man who knows the value of a longtime employee. He is one himself.

Jarvis helped found the firm 28 years ago. He learned the value of loyal, consistent employees by working side by side with them.

In making the presentations, Jarvis said: "The service of a longtime, loyal employee is priceless. It should be honored." He set up the awards plan in 1954.

One of the awardees, Richard Jakob, has worked at Recold as long as Jarvis. He was given a watch.

For 20 years service, the firm awards a diamond pin. Ten years of employment are recognized by a service pin.

Besides Jakob, recent awards went to Elton Nodine, 25 years; Agnes Faessel, 10 years; Leonard Bass, 20 years; Louis Grussmeyer, 26 years; and Jarvis.

Appoints W. O. Chrissinger Co.

Recold announces the appointment of W. O. Chrissinger Co., of Columbus, Ohio (2801 Welsford Road), as a representative for Recold air conditioning products.

Mr. Chrissinger served the Columbus area as an agent for R. E. North & Associates before taking over that firm in February, 1959.

He attended Ohio State University and is a member of the American Society of Heating, Refrigeration and Air Conditioning Engineers.

Other major equipment lines handled by Chrissinger are Anemostat Corporation of America, Waterloo Registers, Young Regulators and Cambridge Filters.

Air Conditioning Creates Office Space in Old Building

»» ADDITIONAL office space, needed because of a rapidly expanding business, was obtained without major construction by air conditioning the 14-story headquarters of N. W. Ayer & Son, Inc., according to Warner S. Shelly, president of the advertising agency.

Mr. Shelly said the installation of air conditioning equipment by Carrier Corporation permitted the agency to make use of about 20,000 square feet of interior space previously unsuited to comfortable working conditions. This represents nearly 12 per cent of the 30-year-old building's total usable area.

As a result, the agency was able to provide for expansion without moving into other buildings in the area, he said.

New Bulletin On Nylon Hose Fittings And Assemblies

››› A NEW four page bulletin on NYLAFLOW nylon pressure hose contains a hose selector and data on a complete range of reusable fittings. Instructions for applying fittings and information on ordering assemblies is included.

The new hose is available in burst pressure ratings of 5000 and 8000 psi in inside diameters from 1/8" to 1/2". New bulletin designated BR-3HF is available from The Polymer Corporation of Pennsylvania, Reading, Pennsylvania.

C. C. Lewis To Assist J. B. Elliott At York

››› CARYL C. Lewis, former vice president in charge of purchasing and material control for Schick Inc. in Lancaster, Pennsylvania, and former general manager of the Auto Radio Division for Radio Corporation of America, in Camden, New Jersey, has been named as staff assistant to Joseph B. Elliott, president of the York Division of Borg-Warner Corporation.

In announcing the appointment, Elliott said that "Lewis' experience in building, equipping and managing a number of modern production facilities will be of great value to the York Division."

The new staff assistant will concern himself with purchasing, scheduling, production, cost control and quality control for all of York's air conditioning, refrigeration and heating products.

Controls Company Opens New District

››› IN a bid to strengthen and broaden its Midwest sales coverage, the Heating and Air Conditioning Division of Controls Company of America, Milwaukee, Wisconsin, has established a new district with headquarters in Wichita, Kansas. Douglas Aitken, a Controls Company sales engineer who formerly serviced customers in Ohio, West Virginia, and western Pennsylvania, has been assigned to this office.

Replacing Mr. Aitken on his former accounts is Robert Pahlow. A 10-year veteran with the firm, Mr. Pahlow previously coordinated all heating and air conditioning sales made through its international subsidiary.

In addition to serving the heating and air conditioning industry, Controls Company specializes in controls systems for the aircraft, guided missile, computer, electronic, vending, automotive, refrigeration, and appliance industries. Its manufacturing and sales facilities are in a number of cities in the United States, Europe and South America.

North Appointed To Board Of Regents

››› THE President of the Chamber of Commerce of the United States, Arthur Motely has appointed Robert H. North, executive secretary of the International Association of Ice Cream Manufacturers, as a member of the Board of Regents for Organization Management.

Under the guidance of the Board of Regents, six Institutes for organization management are held each year. The Institutes offer three-year courses in trade association management.

North has been an instructor in Institutes at Yale, Michigan State and Northwestern University.

McKee Appointed Chief Engineer PFE

››› IN a recent announcement by Charles Ahearn, vice-president and general manager, Pacific Fruit Express Co., San Francisco, Mr. Robert F. McKee was appointed chief engineer of the company to succeed E. F. Gaebler who retired on May 31 after 38 years of service.

In his first announcement upon assuming office, Mr. McKee appointed W. R. Carter as assistant chief engineer.

Classified Advertising

All classified advertisements are payable in advance. Except for Positions and Help Wanted classifications, this section is reserved exclusively for USED equipment.

RATES: 20c per word; minimum 25 words. $2.00 per line for bold face headings: $15.00 per inch for line listings.

WANTED-Experienced engineer for 100-ton Frick ice plant in large Texas City. Must not be over 40 years old, experienced ice maker, and be able to make repairs, and sober. Must have references. Horlock Ice Industries, Inc., 1501 West Webster, Houston 3, Texas.

WANTED—Established Refrigeration and Air-Conditioning Contractor-Distributor covering Philadelphia area is interested in handling additional lines of equipment. Engineering, sales and installation departments are available to handle your products. Address Box SP-5, c/o Industrial Refrigeration.

USED EQUIPMENT—wanted & for sale

WANTED–10x10 ammonia compressor, modern with 440 volt motor. Chun King Corp., P.O. Box 189, Jackson, Ohio.

WANTED—Practically new 30 to 40 ton plant to be dismantled and moved. Prefer grid tank with 11" 300# cans. Write Box AU-3, c/o Industrial Refrigeration.

FOR SALE

2—100 hp. carrier brine chilling units.
2— 11x9 York compressors.
1— 10x10 York, V-belt drive.
2— 8x8 York compressors, 360 r.p.m. syn. motor.
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11½"x22½"x44" ice cans in grids of 4.
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Use QUICKSEAL—stops brine tank leaks.
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FOR SALE—VACUUM PLATES

18 Racks L6-144 Dole cold vacuum plates: 2 racks L4-144 Dole cold vacuum plates. Excellent condition sealed. List excess of $10,500. Asking $2,500. or best offer. Call or write Rucker Cold Storage Co., Box 2971, Greensboro, N. Car., Phone BR 5-2546.

FOR SALE—AMMONIA EQUIPMENT
2— 1-ton York ice making plants, 50# blocks portable gasoline driven.
1— 10"x10" 4-cyl. Frick duplex D.C. to 225 h.p. motor.
3— 10"x10" 4-cyl. York duplex D.C. to 225 h.p. motor.
1— 9"x9" 4-cyl. York duplex D.C. to 150 h.p. motor.
3— 10"x10" 2-cyl. York D.C. to 100 h.p. motor.
1— 9"x9" 2-cyl. York D.C. to 75 h.p. motor.
2— 10"x10" 2-cyl. York with V-type flywheel.
1— 9"x9" 2-cyl. York with V-type flywheel.
2— 7½"x7½" & 8½"x8½" 2-cyl. Vilters.
3x3", 4x4", 5x5" & 6x6" York & Frick compressors.
3x3", 4x4" & 5x5" York condensing units.
6— York floor type blower unit coolers.
1— Niagara floor type blower brine spray.
11"x22"x47" 300-lb Ice cans.
25 to 100-ton ice making plants.
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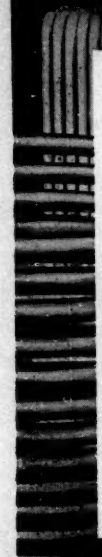

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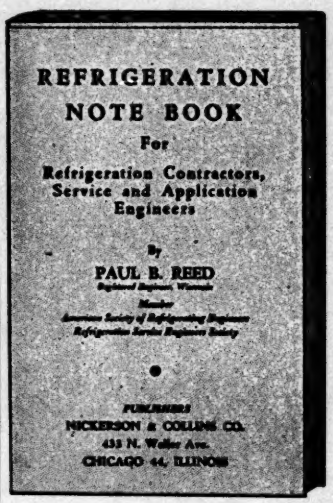

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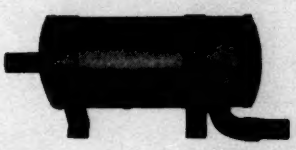

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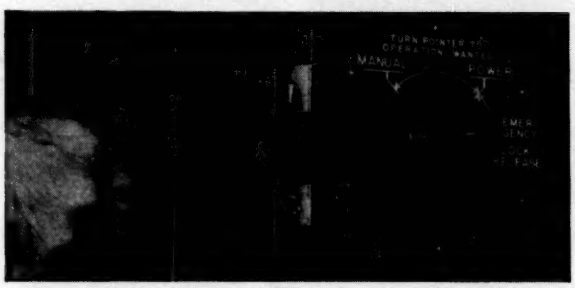

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